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AGRICULTURAL RECORDS
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HARD RED SPRING QUALITY REPORT

Physical, Chemical, Milling, and Baking Characteristics

United States Department of Agriculture
Agricultural Research Service
North Central Region

GRIMES DUE OUTSTANDING, EXPENDED, PAYING TO CROPS
THEIR OWNERS ARE OVER 87% OF THE STATE'S

1988 SPRING AND DURUM AGROPECUARY REPORTS

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WHEAT, SPRING AND DURUM AGROPECUARY REPORTS
ARE PREPARED BY THE NORTH DAKOTA STATE UNIVERSITY, A
UNIVERSITY PARTNERSHIP WITH THE UNIVERSITY OF NORTH DAKOTA, THE UNIVERSITY OF
SOUTH DAKOTA, AND THE U.S. DEPARTMENT OF AGRICULTURE, IN COLLABORATION WITH THE STATE'S
AGRICULTURAL COMMISSIONERS.

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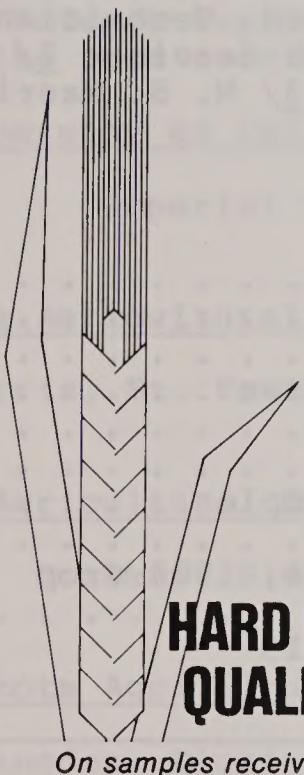
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HARD RED SPRING QUALITY REPORT

On samples received from the 1988 crop

Source:

Spring and Durum Wheat Quality Laboratory

USDA, Agricultural Research Service

Harris Hall, N.D.S.U.

Fargo, North Dakota 58105

REPORT OF PHYSICAL, CHEMICAL, MILLING AND BAKING
EXPERIMENTS WITH HARD RED SPRING WHEAT

1988 CROP_{1/}

by

A. A. Ottenbacher, R. D. Crawford, Technicians, E. J. Winter,
Secretary, Agricultural Research Service; 2/ M. Skunberg and
L. L. Nolte, Technicians, NDSU.3/ M. S. Masri, Research
Scientist.2/

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1/ This is a progress report of cooperative investigations containing some results that have not been sufficiently confirmed to justify general release; interpretations may be modified with additional experimentation. Confirmed results will be published through established channels. Cooperators submitting samples for analysis have been given analytical data on their samples prior to release of this report. The report is primarily a tool for use of cooperators and their official staffs and to those persons having direct and special interest in the development of agricultural research programs.

This report was compiled by the Agricultural Research Service, U. S. Department of Agriculture. Special acknowledgment is made to the North Dakota State University for their facilities and services provided in support of these studies. The report is not intended for publication and should not be referred to in literature citations nor quoted in publicity or advertising. Use of the data may be granted for certain purposes upon written request to the agency or agencies involved.

2/ USDA/ARS Hard Red Spring & Durum Wheat Quality Lab., NDSU.

3/ Dept. of Cereal Science & Food Technology, NDSU.

1988 COOPERATING AGENCIES AND STATIONS

The cooperative agencies and stations conducting the varietal plot and nursery experiments from which the 1988 spring wheat samples were received are listed below:

University of California, Davis

Imperial Valley

Minnesota Agricultural Experiment Station

Crookston, Morris, St. Paul, North area, South area

Montana Agricultural Experiment Station

Bozeman, Sidney, Havre

North Dakota Agricultural Experiment Station

Fargo, Minot, Langdon, Dickinson, Williston, Carrington

South Dakota Agricultural Experiment Station

Redfield, Brookings, Selby

Idaho Agricultural Experiment Station

Aberdeen, Tetonia

Wyoming Agricultural Experiment Station

Sheridan, Powell

Wisconsin Agricultural Experiment Station

Madison

University of Arizona, Department of Plant Science

Tucson

A complete list of all cooperating agencies, stations, and personnel for the year will be found in the report by R. H. Busch, et al., Wheat Varieties Grown in Cooperative Plot and Nursery Experiments in the Spring Wheat Region in 1988.4/

- 4/ Busch, R. H. Wheat Varieties Grown in Cooperative Plot and Nursery Experiments in the Spring Wheat Region in 1988. Agricultural Research Service, U. S. Department of Agriculture and State Agricultural Experiment Station, St. Paul, MN.

INTRODUCTION

Samples of standard varieties and many of the new strains of hard red spring wheat grown in cooperative experiments in the spring wheat region of the United States^{4/} are milled each year by the USDA. The flours are assayed chemically and physically and baked into bread to determine the quality characteristics. The purpose of this report is to make available to the cooperators and other interested parties, quality data on the standard varieties and new strains of hard red spring wheat from the 1988 crop.

The same general format and techniques were used in evaluating the wheat as outlined in quality reports for previous years. The same computer scoring system has been used for the past several years, hence some faulting values differ slightly from earlier years. In general, data contained in this report are comparable to data in past reports and, where applicable, average results and also the average results of other crop years are compared. The area averages are tabulated for the Uniform Regional Nursery varieties of Butte 86, Era, Chris and Stoa. A five-year average (5-YA) and the averages for the individual five years include all selections grown in the Uniform Regional Nurseries for that year. These results give an overview of individual years and the influence of environment on the crop. The actual crop characteristics may be somewhat different due to differences in varieties, but the change from year to year is applicable.

The evaluation of a sample involves three areas of analysis: kernel characteristics, milling performance and baking evaluation. A brief description of the methods is given on pages 9 to 11 of this report. It is possible to deduce the various characteristics of the selection and any outstanding features or deficiencies which are apparent. No specific comments are made regarding the mixogram patterns, since reference mixograms for each of the general types are presented at the end of the report.

In North Dakota seeding began the first week of April although it was very spotty. By the end of the week, seeding was in full swing. The state-wide average starting date was April 10th compared to April 17th last year.

The values for the 1988 crop was comparable to the five year average except for the higher protein and lower flour extraction. Due to the stressful situation brought on by the drought, especially in North Dakota, the protein values were substantially higher. This was as expected. However, the test weight values were satisfactory even though there was an extreme lack of moisture. This was probably due to fairly dry conditions following planting and little if any tillering. This lack of tillering forced the plant to put all energy generally into a single head of wheat, which lowered grain yield, but reduced the number of shrunken kernels expected.

SOURCE OF THE 1988 CROP SAMPLES

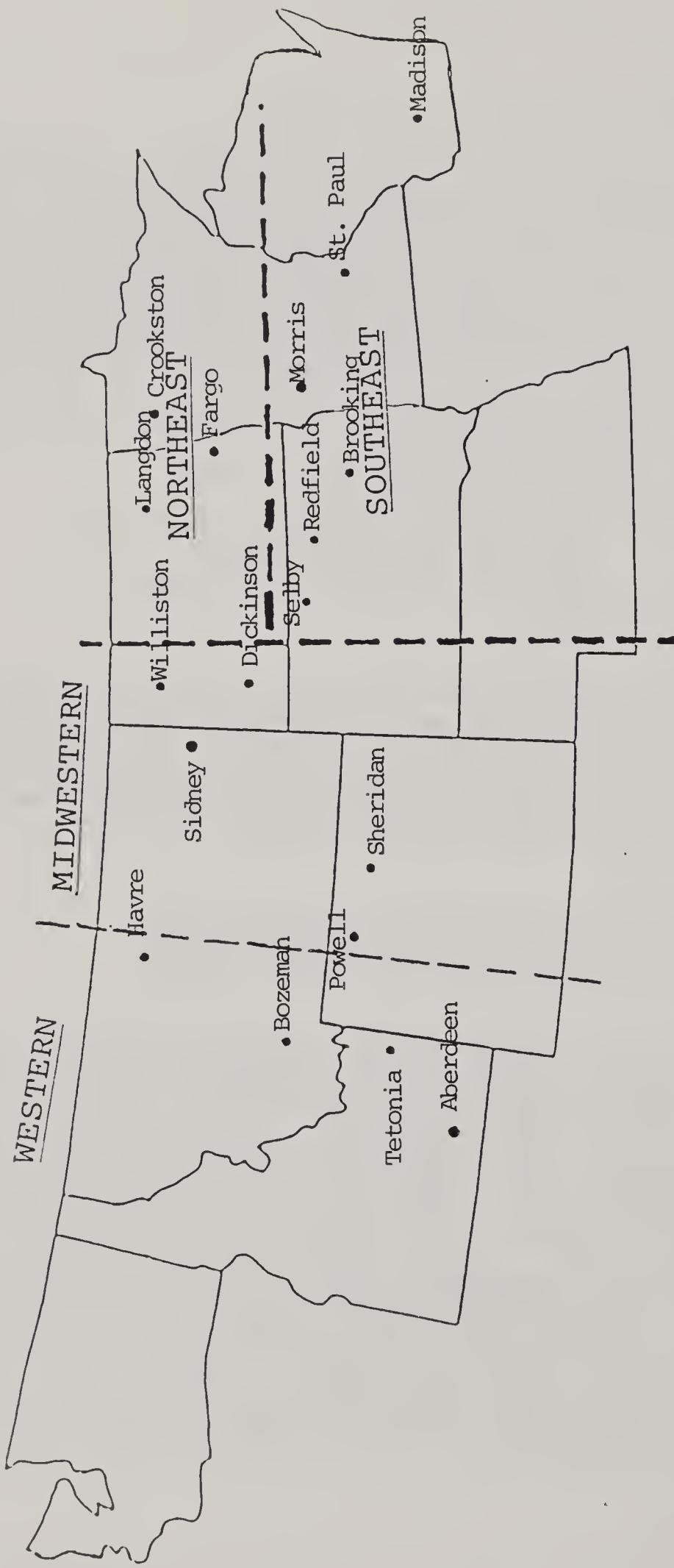
Tests were performed on 1,194 samples. However, data on 594 of these are not included in this report, because this information was of interest to plant breeders at specific experiment stations only. Data presented in this report are from the Field Plot Nursery and the Uniform Regional Nursery. The samples came from 22 stations in 9 states shown below:

Arizona: Tucson
California: Imperial Valley
Idaho: Aberdeen and Tetonia
Minnesota: Crookston, Morris and St. Paul
Montana: Bozeman, Sidney and Havre
North Dakota: Fargo, Minot, Langdon, Dickinson,
 Williston and Carrington
South Dakota: Redfield, Brookings and Selby
Wisconsin: Madison
Wyoming: Sheridan and Powell

The samples received from Arizona and California are Field Plot Nurseries. Therefore they are not included in the following Uniform Regional Nursery discussion. On page 8 are listed the spring wheats that were included in the Uniform Regional Nursery trials. The variety or cross, the station that developed the variety, the state selection number or the C.I. number are also given.

BLENDING AND AVERAGING PROCEDURES USED IN THE UNIFORM REGIONAL NURSERY TRIALS

The geographical areas from which the samples were received are shown on p.7. Because a large number of samples was received from the Western geographical area, it was again subdivided into two areas - Western and Midwestern. Two of the areas had four stations each, one area had six and the fourth area had three stations (see map p.7). This made a more equal blend for each area. Individual wheat samples from the Uniform Regional Nursery originating from the four geographical areas were blended according to area. All but three of the 17 stations were blended; two were incompatible and one was received too late. (The results from these three stations are included as individual data.) Milling performance, mixograms and baking data were obtained from these area blends. However, data for kernel characteristics are arithmetical averages of individual sample analyses. These data from the Uniform Regional Nursery also are compared with averages from the previous four years.



Wheat blends were made according to the geographical areas shown above.

Data for the Field Plot Nursery are on the individual samples.

ENTRIES IN
THE UNIFORM REGIONAL HARD RED SPRING WHEAT PERFORMANCE NURSERY

The 30 entries in the 1988 URHRSWPN are listed below:

Entry No.	Cross or Variety	CI No. or Selection No.	Year Entered	Source
1.	Marquis	3561	1929	Canada
2.	Chris	13751	1969	USDA-MN
3.	Stoa		1987	ND
4.	Era**	13986	1972	USDA-MN
5.	Butte 86		1987	ND
6.	Butte*2/6549-8-1-101/SD8010	SD3005	1987	SD
7.	ND575/SD8025	SD3000	1987	SD
8.	Butte*2/MN7125	SD2980	1986	SD
9.	SD2922/ND581	SD2999**	1987	SD
10.	ND572/SD8025	SD3014	1988	SD
11.	MN72299/MN74115	MN81110**	1986	USDA-MN
12.	ND560/MN7595	MN82354**	1986	USDA-MN
13.	MN73167/MN81070	MN85324**	1988	USDA-MN
14.	MN7357/MN7539	MN85110**	1988	USDA-MN
15.	MN7663/MN81205	MN85328**	1988	USDA-MN
16.	MN74195/MN75182	MN85167**	1988	USDA-MN
17.	ND527/Coteau Sib//Era	ND618**	1986	ND
18.	Len//Butte*S/ND507/3/ND593	ND626**	1986	ND
19.	RL4352-1/Butte	ND640	1987	ND
20.	Stoa Sib/ND617 Sib	ND650**	1988	ND
21.	Stoa/Amidon	ND652	1988	ND
22.	HS79-554/Kitt	HS85-30**	1988	NAPB
23.	HS80-315/MN73167	HS85-476**	1988	NAPB
24.	MN73167/Probrand 711	HS85-674**	1988	NAPB
25.	HS82-448/Angus	HS85-902	1988	NAPB
26.	Pioneer Not Received Yet	2375**	1988	PION
27.	MSFRS	FA984-384	1987	WPB
28.	DHRSP-82 MSFRS	BZ986-345**	1988	WPB
29.	NDM00004/NK000751 S82-62	WA7493**	1988	WA
30.	NDM00004/NK000751 S82-66	WA7494**	1988	WA

** Semidwarf

METHODS

The terminology and methods used are briefly described below:

Test Weight Per Bushel - The weight per Winchester bushel of cleaned, dry, scoured wheat. To determine the dockage-free test weight on a comparable sample, approximately one pound per bushel should be subtracted from the value given.

1000 Kernel Weight - The 1000 kernel weight was determined by counting with a Seedburo seed counter the number of kernels in a 10 g sample of cleaned, picked wheat^{5/}.

Kernel Size - The percentages of the size of the kernels (large, medium and small) were determined on a wheat sizer as described by Shuey^{6/}.

The sieves of the sizer were clothed as follows:

Top Sieve - Tyler #7 with 2.92 mm opening
Middle Sieve - Tyler #9 with 2.24 mm opening
Bottom Sieve - Tyler #12 with 1.65 mm opening

Potential Milling Yield - The potential yield is not shown on the computer tables, but it can be determined by multiplying the percentages of the overs of each sieve #7, #9 and #12 by the value of 78%, 73% and 68%, respectively. The accumulation percentage would be the potential yield.

Milling - The samples were cleaned by passing the wheat over an Emerson kicker and dockage tester and through a modified Forster scourer (Model 6). The clean, dry samples were pretempered to 12% moisture for at least 72 hours; then tempered to 16% moisture and allowed to stand overnight prior to milling.

5/ Mention of a trademark name or a proprietary product does not constitute a guarantee or warranty of the product by the U. S. Department of Agriculture, and does not imply its approval to the exclusion of other products that may also be suitable.

6/ Shuey, William C. A Wheat Sizing Technique for Predicting Flour Milling Yield. Cereal Science Today 5:71-72, 75 (1960).

The Special Uniform Nursery Spring Wheat samples were milled on a Brabender Quadrumat Jr. mill. The mill was equipped with a #18 wire on the drum sieve. The throughs of the #18 wire were rebolted on a Strand sifter equipped with a #60 Tyler sieve. The sample was sifted for 1 minute. The throughs of the #60 wire classified as flour, and this was the material tested. The overs of the #18 wire were classified as bran, and the overs of the #60 Tyler sieve as crude shorts.

The Uniform Regional Nursery blends and the Field Plot Nursery samples were milled on a Buhler continuous experimental mill. This mill has been slightly modified to give results more comparable to commercial milling. The break scalping sieves were clothed with #54 stainless steel wire, the reduction scalping sieves with #58, #66 and #105 stainless steel wire for the first, second and third reduction, respectively. All of the flour sieves were clothed with #135 stainless steel wire.

All six flour streams were combined to give the patent flour. The extraction of a good milling wheat using this flow is approximately 68%. This is comparable to a commercial "long patent" extraction flour. At this flour extraction of the wheat, the changes in flour ash are most sensitive to changes in percent extraction.

Hardness Test

Wheat hardness scores are reported on the samples. The procedure used requires grinding the wheat samples with a Udy grinder and obtaining data from a Technicon 400 near infrared analyzer. Wavelengths used were 1680 nm and 2230 nm. This procedure was developed by Mr. Karl Norris, USDA, Beltsville through a co-operative research project in which this Laboratory also participated. This procedure is not official and may be replaced with another in the future. Hard red spring wheats generally have scores between 60 and 85.

Protein Content - Both the Kjeldahl procedure and the near infrared technique were used to determine protein content. Nitrogen values, as determined by the Kjeldahl procedure, were multiplied by 5.7 to calculate protein values.

Mineral Content or Ash Content - This was determined by measuring the residue of the minerals left after incinerating the sample for approximately 16 hours at 575°C. The results were reported as percentage of the sample weight.

Mixograph Analysis - The mixogram was determined by using 30 g of flour and adding 20 cc of water. The sensitivity spring setting was set at 10. All mixograms were run with constant weight of flour and volume of water. Absorptions reported were adjusted according to the height of the mixogram. The correction factor was determined from a series of flours by varying the amount of absorption.

Mixogram Pattern - The reference mixogram patterns given at the end of the report demonstrate the different types of mixograms that were obtained. A single number is assigned each pattern to characterize and simplify the classification of the curves--the larger number indicating stronger curve characteristics.

Baking Procedure or Formula - The baking formula used was as follows:

100% flour	3% milk D.S.M.
2% salt	3% yeast
5% sugar	2% shortening (Crisco, melted)

The samples were mixed to development in National Manufacturing mixers: the micro mixer for the 25 g samples and the 100 g special mixer for the 100 g samples. Bromate (7.5 ppm) for oxidation and barley malt flour (0.096%) for enzymatic supplement were added to each sample. All doughs were moulded in a Roll-Er-Up moulder.

Absorption - The amount of water, expressed as percent of the flour, required to bring the dough to proper consistency.

Crumb Color - A value was determined by comparing the loaf of the tested sample against a baking standard. This standard was an equal blend of the variety Len grown at Casselton and Minot, ND, and Redfield, SD.

Loaf Volume - The volume of the baked loaf as determined by seed displacement.

All values (protein, ash and absorption) were reported on a 14% moisture basis.

DISCUSSION

The following discussion presents some of the basic techniques and criteria used in the milling and baking quality evaluation of the samples. There are three major evaluation categories used: kernel characteristics, to characterize the kernel; milling performance, to evaluate the general milling characteristics; baking score, to evaluate the flour as to type and overall baking quality.

Each evaluation category can be important. A sample could be of a sufficiently poor quality for a given category to suggest elimination from future testing. However, a sample submitted for the first time and found to be questionable should be tested again to establish if it has a satisfactory or unsatisfactory classification. A sample which is consistently rated as questionable should be discarded.

Five characteristics (test weight, 1000 kernel weight, percent small kernels, wheat ash and wheat protein) were independent variables used to calculate the dependent variable - wheat score. Four characteristics (percent extraction, mineral @ 65% extraction, flour protein and milling character) were used to calculate the dependent variable - mill score. Seven characteristics (mixogram pattern, bake absorption, mixing time, dough characteristics, crumb color, crumb grain and loaf volume) were used to calculate the dependent variable - bake score. These three dependent variables after calculation become independent variables used to calculate a dependent variable, the general evaluation, which is an overall general score.

This is the seventh year our current computer program has been used, which was designed and implemented to handle the analysis and tabulation for the data from each station. This program uses the Statistical Analysis Systems (SAS Institute, Inc., SAS Circle, Box 8000, Cary, NC 27511).^{7/}

The samples are tested and data collected on 17 quality factors or variables. The program then grades each factor against predetermined faulting values and assigns major (MJ) or minor (MI) faults where applicable. The data is then broken down into 3 major areas of concern to relate more directly to agronomic, industrial and consumer requirements. Each sample is assigned a score of 4 in the areas of Wheat Characteristics, Milling Characteristics and Baking Characteristics. The program then adjusts the score (4 = Good promise, 3 = Some promise, 2 = Little promise, 1 = No promise) depending upon the number of major and/or minor faults assigned to that sample.

^{7/} Nolte, L.L., Youngs, V.L., Crawford, R.D., and Kunerth, W.H. 1985. Computer program evaluation of hard red spring wheat. Cereal Foods World 30:227-229.

A general score is also given to each sample. This score is again 1-4 and is obtained by calculating the mean of the other 3 scores. (Wheat, mill and bake scores)

The following tables list the variables used in each scoring area and their specific faulting and scoring values.

WHEAT SCORE

<u>Variables Included</u>	<u>Faulting Limits</u>		<u>Effect on Score</u>	
	<u>Minor</u>	<u>Major</u>	<u>Minor</u>	<u>Major</u>
Test Weight (#/bu)	57.9	56.9	-	-1
1000 Kernel Weight ^{a/} (g)	Mean-2.1	Mean-5.1	-	-1
Small Kernels (%)	8	16	-	-1
Wheat Ash (%)	1.71	1.81	-	-
Wheat Protein (%)	13.9	12.9	-1	-2

MILL SCORE

<u>Variables Included</u>	<u>Faulting Limits</u>		<u>Effect on Score</u>	
	<u>Minor</u>	<u>Major</u>	<u>Minor</u>	<u>Major</u>
Flour Extraction ^{a/} (%)	Mean-2.1	Mean-4.1	-1	-2
Flr. Ash @ 65% Ex. ^{b/}				
Large Samples	.47	.51	-	-1
Small Samples	.57	.61	-	-1
Flour Protein (%)	12.9	12.4	-1	-2
Milling Character ^{c/}	3	2	-1	-2

a/ The mean, or average, is calculated using the standards tested with that station.

b/ The large samples are milled on a Buhler experimental mill, and the small samples are milled on a Quadrumat Jr. experimental mill. Different values are used to compensate for the difference in the efficiency of the two mills and their respective procedures.

c/ 5 = Normal. 4 = Normal-soft. 3 = Soft-normal. 2 = Soft. 1 = Gritty. 0 = Very soft.

BAKE SCORE

<u>Variables Included</u>	<u>Faulting Limits</u>		<u>Effect on Score</u>	
	<u>Minor</u>	<u>Major</u>	<u>Minor</u>	<u>Major</u>
Mixogram Pattern ^{a/}	2,7 or 8	1,or 9-11	-	-1
Bake Absorption (%)	61.9	60.4	-1	-2
Mix Time (min.)	5.75-8.00 or 2.00-2.75	0-1.75 or over 8.00	-1	-2
Dough Characteristic ^{b/}	6,5	4 or less	-	-2
Crumb Color ^{c/}	6-4	3 or less	-	-1
Crumb Grain ^{d/}	7-4	3 or less	-	-1
Loaf Volume ^{e/} (cc)	Lg. Mean-55 Sm. Mean-21	Mean-105 Mean-31	-1 -1	-2 -2

^{a/} Refer to reference mixograms for numerical curve pattern.
(1 = very weak--11 = very strong)

^{b/} 9 = Elastic. 8 = Slightly elastic. 7 = Slightly pliable.
6 = Pliable. 5 = Very pliable. 4 = Very elastic.
3 = Bucky. 2 = Very, very pliable. 1 = Extremely pliable.
0 = Dead.

^{c/} The column headed Crumb Color on the data tables has two scores. The first score is the brightness, or sheen, of the grain as compared to the standard(s). (Standard = 100.) The second score is a single digit indicating the color of the interior of the loaf. 9 = Bright white. 8 = White. 7 = Normal. 6 = Slightly creamy. 5 = Bright creamy. 4 = Creamy. 3 = Very creamy. 2 = Gray. 1 = Very gray. 0 = Dull.

^{d/} The column on the data tables headed Crumb Grain also has two scores. The first score is a numerical comparison against the standard(s). The second score indicates the structure of the grain. 13 = Normal. 12 = Slightly irregular. 11 = Slightly open. 10 = Slightly irregular. 9 = Slightly open and irregular. 8 = Irregular. 7 = Open. 6 = Irregular and slightly open. 5 = Open and slightly irregular. 4 = Irregular and open. 3 = Open and irregular. 2 = Coarse. 1 = Harsh. 0 = Soggy.

^{e/} The mean, or average, is calculated using the standards tested with that station. "Lg." refers to the faulting and scoring values for 100 g. loaves. "Sm." refers to the faulting and scoring values for 25 g. (pup) loaves.

All samples, as in previous years, are compared with a milling and baking standard that represents a blend of the crop year blended to a known quality. However, the samples for the individual stations are evaluated against the average results of the check varieties from the respective stations. The agronomic and climatic conditions of the individual locations can affect the quality of the wheat sample, such that the evaluation at certain locations could have all samples--even the named varieties--classified as questionable to unsatisfactory. Therefore, the evaluation ratings of one station are not directly comparable with those of another station but provide comparison within that station. For example, an area may produce low protein wheats which give large and plump kernels, good milling and kernel characteristics, but low flour protein and unsatisfactory baking performance such as short mixing time, low loaf volume and weak dough characteristics. The wheat from this area could not be considered as a strong spring wheat and would not maintain the quality expected from the spring wheat producing area. A good variety should have tolerance to a wide range of environmental conditions and the overall picture should be taken into consideration for establishing these varieties.

Kernel Characteristics are important in determining the initial value of the wheat and, if extremely poor, could disqualify a new variety from further consideration. Because of the present grading system, it is desirable to have a good test weight. If a sample has a low 1000 kernel weight and small kernel size distribution, it would be considered a poor sample for milling because of the high ratio of bran to endosperm. Therefore, it is desirable to have plump kernels. Wheat ash is an important factor when comparing one variety against other standard varieties. If a sample consistently has higher wheat mineral content, it increases the probability of having high flour ash. Lower protein than the standard varieties is not desirable, because in a low protein crop year the probability of it having such a low protein as to be undesirable (poor baking) is much greater. Therefore, the protein must also be considered as an important characteristic when comparing varieties grown in the same locality.

Milling Performance is very important, especially the subcategory of milling characteristics. If low extraction or high flour ash is obtained, these become major factors which are quite unacceptable from a commercial milling standpoint. All flour mineral contents are reported at a constant extraction of 65%, so that the figures are directly comparable. As a rule of thumb, one can approximate that each point of ash (0.01%) is equivalent to approximately 2% in extraction.

Milling characteristics are also important. A sample which tends to be soft in character requires a different milling technique to be milled properly. On commercial mills flowed for hard vitreous spring wheats, soft milling characteristics cause great difficulty. Therefore, if a sample shows softness in character, it is considered to be unsatisfactory. Likewise, a sample which is extremely hard and vitreous will cause difficulty. Both types of wheat (soft and vitreous) require different roll pressures, clothing, sifter surface and temper to be milled properly. If these wheats are blended with normal bread milling wheats, undesirable results are obtained since these characteristics are not necessarily compatible or additive. Normal to soft score indicates that the sample shows a tendency toward softness of character on the flour mill stocks and extraction. This would indicate that the sample may give some difficulty for certain mill streams, and an adjustment would either have to be made in the milling flow or in tempering procedures to compensate for these differences. The properties of this wheat may or may not be compatible with other wheats with which it may be blended; therefore, it is important to maintain varieties with milling characteristics as uniform as possible.

The amount of protein recovered in the flour for a sample is of importance. High protein wheats yielding low protein flours are not desirable. Such a wheat would have much of the protein distributed in the outer portion of the kernel which would result in excessive protein in the feed streams. Therefore, higher wheat protein would be necessary to yield a flour with protein content comparable to that of a wheat that gives good flour protein recovery.

Mixogram Patterns are important in estimating the strength and mixing tolerance or potential mixing tolerance of a flour. A long, flat curve is more desirable than a short, peaked curve; however, an extremely long curve may be undesirable, if the flour would require excessive mixing for proper development. Both the pattern and length of the curve are important, and both must be considered. Abnormal curves, such as sway-back or long initial time to incorporate the water, indicate undesirable characteristics.

Baking Evaluation takes into account the flour water absorption, mixing time, dough characteristics, loaf volume, crumb texture and machinability. A sample which has low absorption would be unsatisfactory. A sample with extremely short mixing time would also be considered undesirable as a good strong spring wheat. When a sample is in the minimal range for these values, it is considered to be questionable until further testing demonstrates whether a definite deficiency exists.

Doughs having mellow to weak dough properties show a tendency towards weakness. Also, for mellow to strong, the dough is mellow but has a tendency to be strong, and a strong to mellow dough is just the reverse. Since these characteristics are subjective rather than objective, it is necessary at times to estimate the tendency; therefore, the necessity exists for apparent double grades.

The grain or appearance of the interior of the loaf shows how well the sample stood up during baking and may point out or explain some deficiencies which have been observed during the baking test, and are likely related to gluten protein performance (quantity and quality).

Loaf volume indicates potential strength of the flour in a different manner than mixing time or dough characteristics in that it shows the ability or lack thereof for the dough to expand under pressure and to contain the entrapped gases during this expansion. Weak flours act much like balloons, which burst when blown up and collapse and yield low loaf volume or yield an extremely large volume with large holes in the interior of the loaf. Low protein flours and lifeless (dead) doughs exhibit properties similar to putty and do not expand during fermentation or baking and give low loaf volume. Tough and very bucky doughs are bound too tightly and impede expansion of the gases causing low loaf volume. Again their properties are probably related to gluten functionality in the dough.

General Evaluation rating applies only to the data contained in the year of the report. However, a summation of total and major deficiencies, and an average General Evaluation score for the number of years the sample has been tested are also given in the discussion of individual varieties and selections of the Uniform Regional Nursery.

UNIFORM REGIONAL NURSERY SAMPLES - 1988 CROP

Discussion of Area Blends

A total of 602 Uniform Regional Nursery samples were received from 17 stations in 7 states. However, only 512 wheat samples were blended for this crop year by area. The areas tend to represent movement of the wheat in the market (See map, page 7). Kernel characteristics were determined on individual samples to eliminate possible sampling errors. The area blends were then milled and baked by our macro method. Thirty samples were received from each of the 17 stations. Twenty-five selections were included for quality evaluation in the Uniform Regional Nursery samples. The remainder of the samples were the commercially named varieties Butte 86, Chris, Era, Marquis and Stoa.

Data from the southeast area blend are given in Table 3. The six stations included in this blend were Brookings, Redfield and Selby, South Dakota, Morris and St. Paul, Minnesota and Madison, Wisconsin.

Data from the northeast area blend are given in Table 4. The three stations included in this blend were Fargo, and Langdon, North Dakota and Crookston, Minnesota. Minot, North Dakota samples were not included in the area blend because of the wheat characteristics. Samples from Carrington, ND were not included since they arrived after the blends were made. These samples were processed individually, and the data are reported in Tables 7 and 8.

Data from the midwestern area blend are given in Table 5. The four stations included in this blend were Williston and Dickinson, North Dakota; Sheridan and Powell, Wyoming. Sidney, Wyoming was not included in the area blend because of small sample size. These samples were processed individually, and the data are reported in Table 9. Williston, North Dakota submitted two extra samples. These samples were processed individually, and the data are reported in Table 10.

Data from the western area blend are given in Table 6. The four stations included in this blend were Havre and Bozeman, Montana; and Aberdeen and Tetonia, Idaho.

Discussion of Area and Crop Year Averages

In Tables 1 and 2 are given the average area results for the combined data of the varieties Butte 86, Chris, Era and Stoa samples submitted from the 7 states and 17 stations. The area average represents all samples that were grown in that area for the year cited.

The milling and baking results were obtained from the area blend of the wheats in equal proportions from each of the stations for the respective variety or selection. The regular 100 g straight dough rich formula was used in baking. The General Evaluation column includes the overall performance of the blend of each sample. The general evaluation given for the sample area blend may not agree with that of the individual wheat samples within the blend, since averages do not express the range, and poor characteristics may be masked. In an endeavor to clarify this problem, we have included in the discussion of the varieties and selections, the average general evaluation, the number of total deficiencies and the number of major deficiencies -- (Average General Evaluation - #Total Deficiencies/#Major Deficiencies).

Also given in Tables 1 and 2 are comparisons of the previous five crop years, which include all selections grown in the Uniform Regional Nursery for that year as well as the 5 YA. The 1988 crop kernel characteristics (1000 kernel weight and kernel size) were lower than the 5 YA. The test weight was 0.2% higher and the wheat mineral content was 0.03% higher than the 5 YA. The wheat protein content was 2.0% higher and flour protein was 1.9% higher than the 5 YA. Flour extraction was 1.1% lower than the 5 YA. Bake absorption was 0.9% higher than the 5 YA. While the mix time was 3/4 minute shorter than the 5 YA. The values for the dough character and crumb grain were equal to the 5 YA. Loaf volume was lower than the 5 YA.

The General Score shows both crop years 1988 and 1987 to be equal. The test weight and 1000 KWT were lower while the wheat ash was higher by 0.11% for the 1988 crops, wheat protein was 1.4% higher than the 1987 crop. The flour extraction was 0.6% lower for the 1987 crop. Flour protein for the 1988 crop was 1.3% higher than the 1987 crop. Bake absorption was 2.0% lower while the mix time was 3/4 minute shorter than the 1987 crop. The 1987 loaf volume was higher compared to the 1988 crop.

Discussion of Individual Varieties or Selections

For simplicity and brevity, as in previous reports, each selection or variety will be discussed from a general viewpoint rather than emphasis on a specific area.

Average results of the varieties Butte 86, Era and Stoa for each of the individual areas were used as standards for the other selections from that area; therefore, a variety or selection may be rated satisfactory in two different areas, but comparison of the data may show much poorer results for one area due to adverse environmental

conditions. Thus the sample with poor results could be rated as having unsatisfactory quality when compared with the overall spring wheat area, even though it may be rated as showing good promise for one particular area.

By using the same format as used in previous years and employing the computer program, all named varieties receive a general evaluation. (The word descriptions of these numerical scores are as follows: 1-1.4, no promise; 1.5-2.4, little promise; 2.5-3.4, some promise; 3.5-4.0, good promise.) Only those varieties in the "Good Promise" category could be consistently considered as acceptable to the trade both in the domestic, as well as foreign markets. Data for the named varieties of Butte 86, Chris, Era, Marquis and Stoa will be an average of each variety for the last three years.

<u>Butte 86</u>	(3.7 - 16/4)	<u>8/</u>	- Good Promise
<u>Chris</u>	(3.7 - 26/6)		- Good Promise
<u>Era</u>	(3.6 - 22/6)		- Good Promise
<u>Marquis</u>	(3.5 - 28/10)		- Good Promise
<u>Stoa</u>	(3.9 - 16/3)	<u>9/</u>	- Good Promise

BZ986-345 (3.9 - 5/1) (1 yr.)

Faults:

Kernel Characteristics - Satisfactory.

Milling Performance - Milling characteristics.

Baking Evaluation - Mix pattern, crumb grain.

General Evaluation - Good promise.

FA984-384 (3.6 - 20/5) (2 yrs.)

Faults:

Kernel Characteristics - Small kernels.

Milling Performance - Milling characteristics, extraction.

Baking Evaluation - Mix time, dough characteristics, crumb color, crumb grain.

General Evaluation - Good promise.

8/ (Average General Evaluation - # Total Deficiencies/Major Deficiencies)

9/ First year as a check in the Uniform Regional Nursery.

HS 85-30 (3.9 - 8/2) (1 yr.)

Faults:

Kernel Characteristics - Test weight, small kernels.

Milling Performance - Satisfactory.

Baking Evaluation - Crumb color, crumb grain, mix pattern.

HS 84-476 (3.6 - 11/4) (1 yr.)

Faults:

Kernel Characteristics - Small kernels, test weight.

Milling Performance - Satisfactory.

Baking Evaluation - Crumb grain, mix pattern, mix time.

General Evaluation - Good promise.

HS 85-674 (3.7 - 9/4) (1 yr.)

Faults:

Kernel Characteristics - Test weight, small kernels.

Milling Performance - Satisfactory.

Baking Evaluation - Crumb grain, mix pattern.

General Evaluation - Good promise.

HS 85-902 (3.6 - 12/3) (1 yr.)

Faults:

Kernel Characteristics - Test weight, small kernels.

Milling Performance - Milling characteristics.

Baking Evaluation - Mix pattern.

General Evaluation - Good promise.

MN 81110 (3.6 - 38/9) (3 yrs.)

Faults:

Kernel Characteristics - Test weight, small kernels.

Milling Performance - Milling characteristics, ash at 65% extraction.

Baking Evaluation - Mix pattern, crumb color, crumb grain, mix time.

General Evaluation - Good promise.

MN 82354 (3.6 - 27/6) (3 yrs.)

Faults:

Kernel Characteristics - Small kernels, test weight, wheat protein.

Milling Performance - Flour protein.

Baking Evaluation - Mix time, crumb color, crumb grain loaf volume.

General Evaluation - Good promise.

MN 85110 (3.4 - 10/3) (1 yr.)

Faults:

Kernel Characteristics - Test weight.

Milling Performance - Milling characteristics.

Baking Evaluation - Mix time, crumb grain.

General Evaluation - Some promise.

MN 85167 (3.4 - 13/2) (1 yr.)

Faults:

Kernel Characteristics - Test weight, small kernels.

Milling Performance - Milling satisfactory.

Baking Evaluation - Mix time, bake absorption, crumb color, crumb grain.

General Evaluation - Some promise.

MN 85324 (3.6 - 8/3) (1 yr.)

Faults:

Kernel Characteristics - Satisfactory.

Milling Performance - Milling characteristics.

Baking Evaluation - Mix pattern, crumb grain.

General Evaluation - Good promise.

MN 85328 (3.2 - 19/3) (1 yr.)

Faults:

Kernel Characteristics - Small kernels.

Milling Performance - Flour extraction, milling characteristics, ash at 65% extraction.

Baking Evaluation - Mix pattern, crumb grain.

General Evaluation - Some promise.

ND 618 (3.8 - 20/4) (3 yrs.)

Faults:

Kernel Characteristics - Small kernels.

Milling Performance - Satisfactory.

Baking Evaluation - Mix time, mix pattern, crumb grain, crumb color, loaf volume.

General Evaluation - Good promise.

ND 626 (3.7 - 16/9) (3 yrs.)

Faults:

Kernel Characteristics - Small kernels.

Milling Performance - Flour protein.

Baking Evaluation - Mix pattern, crumb grain, loaf volume.

General Evaluation - Good promise.

ND 640 (3.6 - 23/7) (2 yrs.)

Faults:

Kernel Characteristics - Small kernels.

Milling Performance - Satisfactory.

Baking Evaluation - Mix pattern, crumb grain, dough character, mix time, crumb color, loaf volume.

General Evaluation - Good promise.

ND 650 (3.4 - 8/3) (1 yr.)

Faults:

Kernel Characteristics - Small kernels.

Milling Performance - Milling characteristics.

Baking Evaluation - Mix time, crumb grain.

General Evaluation - Some promise.

ND 652 (3.7 - 11/1) (1 yr.)

Faults:

Kernel Characteristics - Small kernels.

Milling Performance - Milling characteristics.

Baking Evaluation - Mix pattern, crumb grain.

General Evaluation - Good promise.

SD 2980 (3.5 - 21/9) (3 yrs.)

Faults:

Kernel Characteristics - Satisfactory.

Milling Performance - Satisfactory.

Baking Evaluation - Mix time, crumb grain, loaf volume, crumb color.

General Evaluation - Good promise.

SD 2999 (3.6 - 16/5) (2 yrs.)

Faults:

Kernel Characteristics - Small kernels.

Milling Performance - Milling characteristics, extraction.

Baking Evaluation - Mix time, crumb grain.

General Evaluation - Good promise.

SD 3000 (3.5 - 21/5) (2 yrs.)

Faults:

Kernel Characteristics - Test weight, small kernels.

Milling Performance - Milling characteristics, flour protein.

Baking Evaluation - Mix pattern, crumb grain, loaf volume, mix time.

General Evaluation - Good promise.

SD 3005 (3.5 - 19/6) (2 yrs.)

Faults:

Kernel Characteristics - Small kernels.

Milling Performance - Milling characteristics, flour extraction.

Baking Evaluation - Crumb grain, mix time, crumb color.

General Evaluation - Good promise.

SD 3014 (3.4 - 10/4) (1 yr.)

Faults:

Kernel Characteristics - Small kernels.

Milling Performance - Milling characteristics, flour extraction.

Baking Evaluation - Crumb grain.

General Evaluation - Some promise.

WA 7493 (3.7 - 10/0) (1 yr.)

Faults:

Kernel Characteristics - Test weight, small kernels, wheat protein.

Milling Performance - Milling characteristics.

Baking Evaluation - Mix pattern, crumb grain, bake absorption.

General Evaluation - Good promise.

WA 7494 (4.0 - 7/0) (1 yr.)

Faults:

Kernel Characteristics - Test weight, small kernels.

Milling Performance - Satisfactory.

Baking Evaluation - Mix pattern, crumb grain.

General Evaluation - Good promise.

2375 (3.6 - 8/2) (1 yr.)

Faults:

Kernel Characteristics - Small kernels.

Milling Performance - Milling characteristics.

Baking Evaluation - Mix time, crumb grain, crumb color.

General Evaluation - Good promise.

1988 UNIFORM REGIONAL HARD RED SPRING WHEAT
NURSERY SAMPLES NOT INCLUDED
IN THE AREA BLENDS

Minot, North Dakota

This station was not included in the area blend because of kernel characteristics. Butte 86, Era and Stoa were used as the standards. The data for this station are given in Table 7.

Carrington, North Dakota

This station was not included in the blends because the samples arrived too late. Butte 86, Era and Stoa were used as the standards. The data for this station are given in Table 8.

Sidney, Montana

This station was not included in the area blend because of small sample size. Butte 86, Era and Stoa were used as the standards. The data for this station are given in Table 9.

FIELD PLOT NURSERY SAMPLES - 1988 CROP

Twenty-eight samples were received from three states at five stations. The data for the individual samples are given in Tables 11-15.

Fargo, Minot and Langdon - North Dakota

Three named varieties were received from Fargo using Len as the standard. Six named varieties were received from Minot using Len as the standard. Three named varieties were received from Langdon. Len was used as the standard. The average general score for Fargo is 3.3, and for Minot 3.2 and for Langdon 3.4. The data for these three stations are given in Tables 11-13.

Imperial Valley - California

Four varieties and nine selections were received from this station using Yecora Rojo as the standard. The data for this station are given in Table 14. The average general score for this station is 2.0.

Tucson - Arizona

Six samples were received from this station using Yecora Rojo as the standard. The data for this station are given in Table 15. The average general score for this station is 1.9.

EXPLANATION OF ABBREVIATIONS LISTED UNDER THE
HEADINGS AND THOSE THAT MAY BE LISTED UNDER
MINOR AND MAJOR DEFICIENCIES ON COMPUTER PRINTOUT

TW = Test Weight
KW = 1,000 Kernel Weight
LG = Large Kernels
SM = Small Kernels

WHT ASH = Wheat Ash
WP; WHT PRO = Wheat Protein
EX = Flour Extraction
M65 = Ash at 65% Flour Extraction

FP; FLR PRO = Flour Protein
MC; MILL CHAR = Milling Characteristics
MLG PER = Milling Performance
MIX ABS = Mixograph Absorption

MX; MIX PAT = Mixograph Pattern Score
BA; BAKE ABS = Actual Bake Absorption
MT; MIX TIME = Actual Dough Mixing Requirements

DC; DOUGH CHAR = Dough Handling Characteristics
CC; CRUMB COLOR = Example - 100 4
100 = Score received for brightness of the
crumb grain
4 = Creamy-the color characteristic of
that particular loaf (only the
second score is faulted)

CG; CRUMB GRAIN = Example - 90 7
90 = Score received for crumb grain
7 = Open-or characteristic of that
loaf's crumb grain (only the
second score is faulted)

LV; LOAF VOL = Loaf Volume

FOOTNOTES FOR TABLES

These footnotes are applicable for specified column headings in all tables that follow

<u>Column Heading</u>	<u>Footnote</u>
TEST WT	Clean dry - Subtract 1 lb/bu for dockage-free TW.
WHT ASH, WHT PRO, ASH @ 65%, FLR PRO, BAKE ABS (100 g loaf)	14% Moisture basis.
MILL CHAR	5 = Normal. 4 = Normal-soft. 3 = Soft-normal. 2 = Soft. 1 = Gritty. 0 = Very soft.
MIX PAT	Refer to reference mixograms for numerical curve pattern. (1 = Very weak - - - 11 = Very strong.)
DOUGH CHAR	9 = Elastic. 8 = Slightly elastic. 7 = Slightly pliable. 6 = Pliable. 5 = Very pliable. 4 = Very elastic. 3 = Bucky. 2 = Very, very pliable. 1 = Extremely pliable. 0 = Dead.
CRUMB COLOR	First column: A realistic score of brightness compared with a 1988 ND standard scored as 100. Second column: 9 = Bright white. 8 = White. 7 = Normal. 6 = Slightly creamy. 5 = Bright creamy. 4 = Creamy. 3 = Very creamy. 2 = Gray. 1 = Very gray. 0 = Dull.
CRUMB GRAIN	First column: A relative overall crumb grain score as compared with a 1988 ND standard scored as 90. Second column: 13 = Normal. 12 = Slightly irregular. 11 = Slightly open. 10 = Slightly irregular and slightly open. 9 = Slightly open and slightly irregular. 8 = Irregular. 7 = Open. 6 = Irregular and slightly open. 5 = Open and slightly irregular. 4 = Irregular and open. 3 = Open and irregular. 2 = Coarse. 1 = Harsh. 0 = Soggy.

QUALITY DATA OF UNIFORM REGIONAL BLEND
AREA AND CROP-YEAR AVERAGES

TABLE 1

VARIETY	STD #/BU	WT G.	K.WT %	LG %	SM %	ASH %	PRO %	NESS %	SCORE ***	EXT %	65%EX %	PRO %	CHAR %	SCORE ***	ABS %	MIX.	
																MIX	
***WESTERN AREA ***																	
BUTTE 86	S	62.4	32.5	32	2	1.58	15.5	87	4	70.0	0.35	14.3	5	4	67.6	4	
CHRIS	S	61.4	27.0	13	4	1.57	15.9	84	4	68.9	0.34	15.0	4	4	66.0	4	
ERA	S	62.3	28.7	19	5	1.64	14.3	79	4	70.9	0.33	13.0	5	4	63.8	5	
STOA	S	62.2	31.2	22	3	1.56	15.1	86	4	70.9	0.33	14.1	5	4	69.1	6	
AREA AVERAGE		61.9	32.9	32	3	1.57	15.3	81	4	69.6	0.34	14.2	4	4	66.9	5	
***NORTHEASTERN AREA ***																	
BUTTE 86	S	61.6	33.5	41	1	1.60	16.4	85	4	69.0	0.38	15.2	4	4	69.7	5	
CHRIS	S	60.6	27.8	17	3	1.64	16.7	100	4	68.9	0.35	15.8	4	4	67.6	4	
ERA	S	61.4	30.9	33	2	1.70	15.1	89	4	70.8	0.37	13.8	5	4	67.6	5	
STOA	S	61.2	29.8	17	2	1.59	16.0	85	4	69.7	0.38	15.0	4	4	68.8	7	
AREA AVERAGE		61.1	33.1	38	1	1.66	16.2	83	4	69.2	0.37	15.1	4	4	68.0	6	
***SOUTHEASTERN AREA ***																	
BUTTE 86	S	60.2	26.1	13	7	1.68	16.1	89	4	67.7	0.40	15.2	4	4	70.3	6	
CHRIS	S	58.8	21.5	5	15	1.92	16.9	93	4	67.0	0.41	16.2	4	4	69.1	5	
ERA	S	58.6	23.4	7	16	1.99	15.8	87	3	66.4	0.44	14.9	4	4	68.5	6	
STOA	S	58.7	24.2	6	11	1.97	16.0	90	4	67.6	0.41	15.3	4	4	70.3	8	
AREA AVEPAGE		58.5	25.3	9	10	1.93	16.5	83	4	67.2	0.42	15.8	4	4	69.0	7	
***MIDWESTERN AREA ***																	
BUTTE 86	S	60.0	26.5	12	5	1.70	17.1	85	4	68.4	0.41	16.0	4	4	70.0	6	
CHRIS	S	58.2	21.4	3	12	1.70	17.7	82	4	67.2	0.39	16.9	4	4	70.9	6	
ERA	S	59.4	24.4	7	9	1.77	16.0	97	4	69.3	0.41	15.4	4	4	70.0	7	
STOA	S	58.8	23.3	2	13	1.76	16.5	78	4	69.3	0.40	15.6	4	4	69.7	7	
AREA AVEPAGE		59.3	26.5	11	7	1.76	17.1	70	4	67.6	0.40	16.1	4	4	69.6	6	

QUALITY DATA OF UNIFORM REGIONAL BLEND

TABLE 1 (Cont.)

AREA AND CROP-YEAR AVERAGES

VARIETY	STD	BAKE ABS %	MIX TIME MIN	DOUGH CHAR	CRUMB COLOR	GRAIN VOL CC	BAKE SCORE ***	GENERAL SCORE ***	DEFICIENCIES								
									TW	KW	SM	WF	EX	A65	FP	MC	MX
***WESTERN AREA ***																	
BUTTE 86	S	67.1	2.50	7	100	8	88	6	765	3	3.7				MI	MI	MI
CHRIS	S	64.1	2.50	7	101	6	87	4	715	2	3.3				MJ	MJ	MJ
ERA	S	62.8	3.00	7	101	8	88	6	790	4	4.0				MI	MI	MI
STOA	S	67.7	3.75	7	101	8	87	4	750	3	3.7				MJ	MJ	MJ
AREA AVERAGE	S	65.6	3.02	7	101	8	88	7	799	4	4.0				MI	MI	MI
***NORTHEASTERN AREA ***																	
BUTTE 86	S	67.3	3.00	7	101	7	88	6	790	4	4.0				MI	MI	MI
CHRIS	S	65.2	2.75	8	101	7	87	7	865	3	3.7				MJ	MJ	MJ
ERA	S	65.1	3.50	7	101	8	88	4	780	3	3.7				MI	MI	MI
STOA	S	66.4	4.50	7	100	7	88	7	720	3	3.7				MI	MI	MI
AREA AVERAGE	S	66.2	3.53	8	101	7	87	5	836	4	4.0				MI	MI	MI
***SOUTHEASTERN AREA ***																	
BUTTE 86	S	66.5	3.50	7	100	6	88	3	815	3	3.7				MI	MI	MI
CHRIS	S	66.4	3.25	7	102	8	86	4	840	3	3.7				MJ	MJ	MJ
ERA	S	66.0	4.50	7	100	7	89	8	835	4	3.7				MI	MI	MI
STOA	S	67.1	4.75	8	100	7	89	8	810	4	4.0				MI	MI	MI
AREA AVERAGE	S	66.2	4.26	8	101	7	88	6	882	4	4.0				MI	MI	MI
***MIDWESTERN AREA ***																	
BUTTE 86	S	67.2	3.00	8	101	8	88	5	905	4	4.0				MI	MI	MI
CHRIS	S	68.0	3.00	8	100	4	86	3	875	3	3.7				MJ	MJ	MJ
ERA	S	67.4	4.00	8	100	7	87	4	820	3	3.7				MI	MI	MI
STOA	S	67.1	4.25	8	100	7	80	8	810	4	4.0				MI	MI	MI
AREA AVERAGE	S	67.2	3.64	8	101	7	87	5	874	4	4.0				MI	MI	MI

COUNTRY DATA OF UNIFORM PROFESSIONAL ENDOS

AREA AND CROP-YEAR AVEPALS

TABLE 2

VARIETY	STD	TEST	1000	SIZING	WT	WHT	HARD-	WHEAT	FLR	ASH @	FLR	MILL	MILL	MIX	MIX
		WT #/BU	K.WT G.	LG %	SM %	ASH %	PRO %	NESS %	SCORE ***	EXT %	ES%EX %	PRO %	CHAR %	SCORE ***	AES %
***CROP-YEAR AVERAGES ***															
1983 AVERAGE		59.4	30.6	19	4	1.81	14.7	.	.	4	68.8	0.39	13.7	5	4
1984 AVERAGE		60.0	31.5	30	5	1.66	13.7	.	3	69.9	0.39	13.0	5	4	62.7
1985 AVERAGE		60.8	32.4	33	3	1.62	14.0	.	4	70.6	0.36	13.0	5	4	64.3
1986 AVERAGE		59.0	29.8	23	5	1.77	14.4	6.7	4	69.3	0.37	13.4	5	4	65.8
1987 AVERAGE		60.8	32.6	37	3	1.62	14.9	7.0	4	69.0	0.35	14.0	5	4	67.3
1988 AVERAGE		60.2	29.4	23	5	1.73	16.3	8.1	4	68.4	0.38	15.3	4	4	68.4
1983-87 AVERAGE	S	60.0	31.4	28	4	1.70	14.3	6.9	4	69.5	0.37	13.4	5	4	64.8

QUALITY DATA OF UNIFORM REGIONAL BLEND

AREA AND CROP-YEAR AVERAGES

VARIETY	STD	BAKE ABS %	MIX TIME MIN	DOUGH CHAR	CRUMB COLOR	GRAIN	LOAF VOL CC	BAKE SCORE ***	DEFICIENCIES					
									TW	KW	SM	WP	EX	A65

***CROP-YEAR AVERAGES ***

1983	AVERAGE	64.3	4.25	8	101	7	88	6	926	4.0
1984	AVERAGE	63.5	4.25	8	101	6	88	7	872	3.7
1985	AVERAGE	64.4	4.00	8	101	7	88	6	875	4.0
1986	AVERAGE	66.7	4.00	9	101	7	88	7	934	4.0
1987	AVERAGE	68.3	4.25	8	101	7	87	5	898	4.0
1988	AVERAGE	66.3	3.50	8	101	7	88	6	848	4.0
1983-87	AVERAGE	65.1	4.25	0	101	7	88	6	901	4.0

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 3 STATE= SOUTHEASTERN AREA NURSERY=BLEND

VARIETY	STD	TEST WT #/BU	1000 K.WT G.	SIZING LG %	WHT SM %	ASH %	HARDNESS %	WHEAT SCORE ***	FLR 65%EX %	ASH @ 65%EX %	FLR PRO %	MILL CHAR %	MILL SCORE ***	MILL PRO %	MIX ABS %	MIX PAT %
BUTTE 86	S	60.2	26.1	7	1.68	16.1	89	4	67.7	0.40	15.2	4	4	70.3	6	
CHRIS	S	58.8	21.5	5	1.92	16.9	93	4	67.0	0.41	16.2	4	4	69.1	5	
ERA		58.6	23.4	7	1.99	15.8	87	3	66.4	0.44	14.9	4	4	68.5	6	
MARQUIS	S	57.9	22.1	5	2.03	16.4	84	4	65.7	0.47	15.4	3	3	68.2	6	
STOIA	S	58.7	24.2	6	1.97	16.0	90	4	67.6	0.41	15.3	4	4	70.3	8	
BZ 986-345		58.9	29.2	20	6	1.89	16.6	75	4	67.0	0.45	16.0	4	4	67.6	7
FA 984-384		61.3	25.7	7	8	1.93	16.6	93	4	65.7	0.44	15.9	3	3	70.0	6
HS 85-30		57.4	24.7	7	11	1.99	15.9	76	4	67.1	0.45	15.2	4	4	70.6	8
HS 85-476		55.5	24.6	12	10	2.12	17.2	74	3	67.9	0.44	17.0	4	4	70.3	8
HS 85-674		56.9	26.2	10	11	2.05	16.0	67	3	67.9	0.42	15.6	4	4	69.1	8
HS 85-902		57.6	24.8	9	8	1.87	16.6	87	4	67.7	0.42	15.7	4	4	68.5	8
MN 81110		55.6	26.2	10	9	2.16	17.9	89	3	66.5	0.46	17.3	3	3	71.5	8
MN 82354		57.3	23.7	6	14	1.95	16.5	80	4	67.8	0.39	16.0	4	4	68.2	6
MN 85110		56.0	28.6	23	7	2.07	16.8	80	3	67.9	0.44	15.7	4	4	69.4	6
MN 85167		57.3	25.5	10	10	2.01	16.5	64	4	66.9	0.44	16.3	3	3	67.3	5
MN 85324		62.9	27.0	14	7	1.98	16.4	84	4	67.1	0.43	15.5	4	4	70.6	8
MN 85328		58.5	23.5	4	10	2.00	17.2	101	4	63.7	0.52	16.6	2	1	69.7	7
ND 618		59.3	23.2	3	12	1.93	16.7	94	4	68.9	0.42	15.9	4	4	68.8	6
ND 626		58.1	25.9	13	9	1.78	16.7	88	4	68.6	0.38	16.0	4	4	67.9	7
ND 640		58.7	21.9	2	17	1.80	16.7	88	3	68.3	0.37	16.3	4	4	68.5	8
ND 650		61.0	24.7	9	8	1.87	17.4	104	4	66.9	0.42	16.7	3	3	71.2	6
ND 652		59.9	25.6	8	9	1.94	16.8	97	4	67.3	0.44	16.1	3	3	70.6	8
SD 2980		61.6	26.7	11	6	1.88	16.0	80	4	68.1	0.34	15.1	4	4	68.2	5
SD 2999		58.3	25.7	11	9	1.82	15.8	74	4	66.5	0.43	15.4	3	3	67.0	6
SD 3000		57.8	27.0	8	9	1.97	16.3	81	4	66.2	0.45	15.2	3	3	67.6	7
SD 3005		59.2	25.8	11	9	1.86	15.9	66	4	66.5	0.39	15.3	3	3	67.6	6
SD 3014		58.4	25.2	5	10	1.88	15.8	85	4	67.1	0.42	14.8	4	4	67.6	6
WA 7493		57.0	25.7	6	13	1.87	15.7	64	4	68.0	0.37	15.4	4	4	67.9	7
WA 7494		57.5	26.1	7	12	1.90	16.1	64	4	67.4	0.43	15.4	4	4	67.6	7
2375		59.1	28.8	10	10	1.81	16.5	92	4	67.3	0.44	15.7	4	4	69.1	6

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 3 (Cont.) STATE= SATION=SOUTHEASTERN AREA NURSERY-BLEND

VARIETY	STD	BAKE ABS %	MIX TIME MIN	DOUGH CHAR	CRUMB COLOR	GRAIN VOL CC	BAKE SCORE ***	GENERAL SCORE ***	DEFICIENCIES TW KW SM WP EX A65 FP MC MX BA MT DC CC CG LV								
									TW	KW	SM	WP	EX	A65	FP	MC	MX
BUTTE 86	S	66.5	3.50	7	100	6	88	3	815	3	3.7					MI	MJ
CHRIS	S	66.4	3.25	7	102	8	86	4	840	3	3.7					MI	MJ
ERA	S	66.0	4.50	7	100	7	89	8	835	4	3.7					MI	MI
MARQUIS	S	65.7	3.25	8	100	7	88	7	850	4	3.7					MI	MI
STOA	S	67.1	4.75	8	100	7	89	8	810	4	4.0					MI	MI
BZ 986-345	S	65.3	5.00	8	100	7	90	12	840	4	4.0					MI	MI
FA 984-384	S	66.9	3.50	6	100	4	88	4	805	3	3.3					MI	MJ
HS 85-30	S	68.5	5.00	8	100	7	87	4	895	3	3.7					MI	MJ
HS 85-476	S	68.1	6.00	9	101	8	88	6	975	3	3.3					MI	MI
HS 85-674	S	67.0	5.50	8	101	8	88	6	865	4	3.7					MI	MI
HS 85-902	S	66.6	5.50	8	101	4	86	4	860	3	3.7					MI	MJ
MN 81110	S	67.4	3.75	9	101	7	88	6	975	4	3.3					MI	MI
MN 82354	S	65.0	3.50	8	100	7	89	11	855	4	4.0					MI	MI
MN 85110	S	65.5	3.25	8	101	7	88	8	905	4	3.7					MI	MI
MN 85167	S	65.1	3.50	8	100	4	87	4	905	3	3.3					MI	MI
MN 85324	S	67.4	5.00	9	101	8	87	4	935	3	3.7					MI	MI
MN 85328	S	66.6	4.50	9	101	8	88	4	965	3	2.7					MI	MI
ND 618	S	65.9	4.00	9	101	8	89	8	890	4	4.0					MI	MI
ND 626	S	64.1	4.50	9	101	8	89	8	885	4	4.0					MI	MI
ND 640	S	65.0	5.00	8	100	4	88	4	885	3	3.3					MI	MI
ND 650	S	67.4	3.25	9	101	8	86	4	935	3	3.3					MI	MI
ND 652	S	67.9	4.00	9	102	8	86	4	930	3	3.3					MI	MI
SD 2980	S	65.5	3.25	8	101	7	87	4	815	3	3.7					MI	MI
SD 2999	S	65.0	3.75	9	101	8	88	4	965	3	3.3					MI	MI
SD 3000	S	65.3	5.50	8	100	7	87	4	865	3	3.3					MI	MI
SD 3005	S	64.5	4.25	9	100	7	88	4	960	3	3.3					MI	MI
SD 3014	S	65.5	4.25	9	101	8	87	4	885	3	3.7					MI	MI
WA 7493	S	65.8	4.75	8	100	8	89	8	850	4	4.0					MI	MI
WA 7494	S	65.3	4.50	8	100	8	89	8	860	4	4.0					MI	MI
2375	S	66.8	3.50	8	100	6	89	11	815	4	4.0					MI	MI

DEFICIENCIES TW KW SM WP EX A65 FP MC MX BA MT DC CC CG LV
MINOR FAULTING VALUES 57.9 21.8 8 13.9 65.3 .47 12.9 3 2,7,8
MAJOR FAULTING VALUES 56.9 18.8 18 12.9 63.3 .51 12.4 2 1,9-11
*** 1-HO PROMISE 2-LITTLE PROMISE 3-SOME PROMISE 4-GOOD PROMISE.

** J - NO PROMISE 2-LITTLE PROMISE 3-SOME PROMISE 4-GOOD PROMISE.

MIX TIME (MT) DC CC CG LV
6 6 6 8 767
4 3 4 717

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 4 STATE=. STATION=NORTHEASTERN AREA NURSERY-BLEND

VARIETY	STN'D	WT #/BU	K.WT G.	TEST	1000 SIZING	WHT SM	WHT PRO %	HARDNESS %	WHEAT SCORE ***	FLR EXT %	ASH 65%EX %	FLR PRO %	MILL CHAR %	MILL SCORE ***	MIX ABS %	MIX PAT %
BUTTE 86	S	61.6	33.5	41	1	1.60	16.4	85	4	69.0	0.38	15.2	4	4	4	5
CHRIS	S	60.6	27.8	17	3	1.64	16.7	100	4	68.9	0.35	15.8	4	4	4	4
ERA	S	61.4	30.9	33	2	1.70	15.1	89	4	70.8	0.37	13.8	5	4	4	5
MARQUIS	S	60.8	28.7	21	2	1.77	16.1	87	4	68.3	0.38	14.7	4	4	4	4
STOA	S	61.2	29.8	17	2	1.59	16.0	85	4	69.7	0.38	15.0	4	4	4	4
BZ 986-345	S	61.1	38.7	67	1	1.74	16.2	72	4	67.7	0.36	15.2	4	4	4	6
FA 984-384	S	63.4	33.4	36	1	1.69	16.8	93	4	67.9	0.33	15.4	4	4	4	6
HS 85-30	S	61.0	35.2	46	1	1.73	15.5	82	4	68.9	0.40	14.4	4	4	4	6
HS 85-476	S	59.0	34.6	62	1	1.69	17.0	73	4	70.1	0.35	16.5	5	4	4	7
HS 85-674	S	61.2	34.9	45	1	1.71	15.3	70	4	70.1	0.33	14.6	5	4	4	6
HS 85-902	S	61.3	33.7	51	1	1.68	16.1	84	4	69.6	0.38	14.8	4	4	4	6
MN 81110	S	59.0	33.9	44	1	1.74	17.9	92	4	67.5	0.39	17.1	4	4	4	7
MN 82354	S	61.3	32.0	35	2	1.49	15.8	78	4	72.0	0.37	15.0	5	4	4	6
MN 85110	S	59.2	39.2	69	1	1.72	16.3	80	4	65.9	0.38	15.2	3	2	2	6
MN 85167	S	60.3	33.6	45	1	1.72	15.8	69	4	71.4	0.38	15.1	5	4	4	6
MN 85324	S	60.5	34.9	49	2	1.66	15.8	81	4	66.8	0.39	14.5	3	2	2	7
MN 85328	S	61.4	29.4	20	2	1.82	17.5	102	4	68.0	0.44	16.0	4	4	4	6
ND 618	S	61.2	28.5	15	3	1.66	16.7	87	4	69.2	0.37	15.8	4	4	4	6
ND 626	S	62.1	34.2	50	1	1.56	16.2	89	4	69.9	0.37	15.2	4	4	4	6
ND 640	S	61.4	28.8	15	2	1.64	16.9	90	4	71.2	0.33	15.8	5	4	4	7
ND 650	S	62.5	31.6	39	1	1.64	17.2	96	4	69.0	0.41	16.1	4	4	4	6
ND 652	S	61.4	32.3	37	1	1.65	16.8	100	4	69.0	0.39	15.8	4	4	4	7
SD 2980	S	63.0	32.6	39	1	1.58	15.8	81	4	69.8	0.31	14.6	4	4	4	5
SD 2999	S	60.8	31.9	34	1	1.65	15.4	72	4	69.0	0.37	14.5	4	4	4	6
SD 3000	S	60.3	34.3	38	1	1.73	16.0	82	4	68.4	0.37	14.6	4	4	4	6
SD 3005	S	61.6	32.7	42	1	1.63	16.5	77	4	69.2	0.34	15.4	4	4	4	6
SD 3014	S	61.4	33.0	25	1	1.63	15.3	82	4	68.4	0.33	14.0	4	4	4	6
WA 7493	S	60.5	36.5	43	1	1.59	15.1	63	4	71.4	0.38	14.3	5	4	4	6
WA 7494	S	60.6	34.8	38	2	1.59	14.8	62	4	70.8	0.39	14.1	5	4	4	6
2375		62.0	36.6	40	3	1.64	16.6	90	4	68.4	0.36	15.1	4	4	4	6
												70.3				

QUALITY DATA OF SPRING WHEAT SAMPLES 19B8 CROP

TABLE 4 (Cont.)

STATE = NORTHEASTERN AREA NURSERY = END

VARIETY	STD	BAKE			MIX			DOUGH			CRUMB			GRAIN			BAKE			GENERAL			DEFICIENCIES					
		ABS	%	MIN	TIME	CHAR	COLOR	VOL	GRAIN	VOL	CC	SCORE	SCORE	SCORE	WP	EX	A65	FP	MC	MX	BA	MT	DC	CC	CG	LV		

BUTTE 86	S	67.3	3.00	7	1.01	7	88	6	790	4	4.0																	
CHRIS	S	65.2	2.75	8	1.01	7	87	7	865	3	3.7																	
ERA	S	65.1	3.50	7	1.01	8	88	4	780	3	3.7																	
MARQUIS	S	64.9	3.00	7	1.00	7	88	4	790	3	3.7																	
STOA	S	66.4	4.50	7	1.00	7	88	7	720	3	3.7																	
B2 986-345	S	63.5	4.25	8	1.02	8	88	8	860	4	4.0																	
FA 984-384	S	66.0	3.25	7	1.01	7	87	4	760	3	3.7																	
HS 85-30	S	67.7	3.50	8	99	2	88	7	845	3	3.7																	
HS 85-476	S	68.1	3.75	9	1.01	8	87	3	915	3	3.7																	
HS 85-674	S	65.6	4.00	8	1.01	8	86	4	835	3	3.7																	
HS 85-902	S	65.4	4.75	8	1.01	8	86	4	815	3	3.7																	
MN 81110	S	68.7	3.25	8	1.00	7	86	4	875	3	3.7																	
MN 82354	S	66.2	3.00	7	1.01	7	88	8	785	4	4.0																	
MN 85110	S	66.5	2.75	9	1.00	8	89	8	910	3	3.0																	
MN 85167	S	63.6	3.25	8	1.00	6	88	4	830	3	3.7																	
MN 85324	S	66.3	4.00	9	1.00	7	88	3	890	3	3.0																	
MN 85328	S	66.6	3.50	7	1.00	8	86	4	770	3	3.7																	
ND 618	S	66.0	3.50	8	1.00	7	88	7	800	4	4.0																	
ND 626	S	66.0	3.50	8	1.00	7	87	4	875	3	3.7																	
ND 640	S	66.8	4.50	9	1.00	7	87	4	915	3	3.7																	
ND 650	S	69.0	2.75	9	1.00	8	87	3	925	2	3.3																	
ND 652	S	67.5	4.00	7	1.01	8	87	4	800	3	3.7																	
SD 2980	S	66.6	2.75	9	1.00	7	88	3	935	2	3.3																	
SD 2999	S	67.0	3.00	8	1.00	8	89	11	875	4	4.0																	
SD 3000	S	66.9	4.25	8	1.00	7	86	3	835	3	3.7																	
SD 3005	S	65.5	3.25	8	1.00	7	88	6	840	4	4.0																	
SD 3014	S	64.9	3.50	8	1.01	8	87	4	820	3	3.7																	
WA 7493	S	64.3	4.00	8	1.02	8	88	9	825	4	4.0																	
WA 7494	S	63.6	3.50	7	1.02	8	89	8	775	4	4.0																	
2375	S	68.2	3.50	8	1.00	8	87	4	825	3	3.7																	

DEFICIENCIES	TW	KW	SM	WP	EX	A65	FP	MC	MX	BA	MIX TIME (MT)
MINOR FAULTING VALUES	57.9	29.3	8	13.9	67.1	.47	12.9	3	2.7, 0	61.9	5:75-8.00
MAJOR FAULTING VALUES	56.9	25.3	18	12.9	65.1	.51	12.4	2	1,9-11	60.4	UNDER 1.75 OVER 8.00

*** 1=NO PROMISE 2=LITTLE PROMISE 3=SOME PROMISE 4=GOOD PROMISE.

*** 1=NO PROMISE 2=LITTLE PROMISE 3=SOME PROMISE 4=GOOD PROMISE.

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 5 STATE= STATION=MIDWESTERN AREA NURSERY=BLEND

VARIETY	STD	TEST WT #/BU	1000 K.WT G.	SIZING LG %	WHT SM %	ASH PRO %	HARDNESS ***%	WHEAT SCORE ***%	FLR EXT %	ASH @ 65% EX %	FLR PRO %	MILL CHAR %	MILL SCORE ***%	MIX ABS %	MIX PAT %
BUTTE 86	S	60.0	26.5	12	5	1.70	17.1	85	4	68.4	0.41	16.0	4	4	70.0
CHRIS	S	58.2	21.4	3	12	1.70	17.7	82	4	67.2	0.39	16.9	4	4	70.9
ERA		59.4	24.4	7	9	1.77	16.8	87	4	69.3	0.41	15.4	4	4	70.0
MARQUIS	S	57.9	22.4	2	14	1.77	17.1	76	4	66.1	0.41	15.9	3	3	68.8
STOA	S	58.8	23.3	2	13	1.76	16.5	78	4	68.3	0.40	15.6	4	4	69.7
BZ 986-345		59.1	31.0	23	3	1.80	17.7	73	4	66.1	0.41	16.3	3	3	68.2
FA 984-384		61.8	27.3	10	4	1.65	16.8	84	4	66.9	0.38	15.6	3	3	68.2
HS 85-30		59.4	28.5	14	4	1.82	16.8	75	4	67.6	0.39	15.8	4	4	70.6
HS 85-476		56.6	26.8	14	4	1.90	18.0	67	3	68.7	0.42	17.5	4	4	70.6
HS 85-674		57.7	26.9	10	6	1.76	16.9	64	4	68.8	0.40	16.3	4	4	70.3
HS 85-902		60.2	27.6	17	4	1.76	17.1	81	4	67.5	0.41	15.8	3	3	67.9
MN 81110		56.6	26.6	8	6	1.77	18.4	79	3	67.0	0.43	17.5	3	3	71.5
MN 82354		59.0	26.1	9	8	1.70	16.5	73	4	69.7	0.35	15.6	4	4	69.1
MN 85110		58.0	32.2	33	3	1.87	17.4	77	4	66.0	0.44	15.8	3	3	70.3
MN 85167		58.1	27.4	14	6	1.86	16.8	62	4	67.6	0.41	16.3	3	3	66.3
MN 85324		58.8	27.8	16	4	1.78	17.1	73	4	67.2	0.41	16.1	3	3	71.5
MN 85328		59.6	23.8	3	10	1.83	18.4	96	4	63.9	0.46	17.3	3	2	70.0
ND 618		59.6	23.1	3	10	1.76	17.2	87	4	68.7	0.43	15.9	4	4	71.2
ND 626		60.2	27.4	16	5	1.67	17.5	84	4	69.5	0.39	16.4	4	4	70.3
ND 640		60.2	23.8	3	10	1.68	16.9	81	4	69.8	0.36	15.8	4	4	68.2
ND 650		61.3	25.0	7	6	1.69	17.5	94	4	67.7	0.41	16.7	3	3	71.5
ND 652		60.1	25.6	8	6	1.73	17.2	87	4	67.9	0.42	16.1	3	3	70.3
SD 2980		61.7	27.5	12	4	1.64	16.7	79	4	68.1	0.33	15.5	4	4	69.1
SD 2999		59.2	26.1	11	8	1.77	16.7	70	4	66.5	0.40	15.6	3	3	70.0
SD 3000		59.3	27.6	16	6	1.77	16.6	76	4	67.2	0.42	15.4	3	3	70.6
SD 3005		59.7	26.0	13	6	1.80	17.1	68	4	65.5	0.38	16.1	3	2	68.5
SD 3014		59.9	26.3	15	9	1.79	16.5	81	4	67.7	0.38	15.0	3	3	68.8
WA 7493		58.2	28.3	9	7	1.72	16.5	59	4	67.8	0.41	16.0	3	3	67.9
WA 7494		58.4	29.5	18	6	1.79	16.5	61	4	69.4	0.38	16.0	4	4	68.8
2375		60.6	29.4	12	6	1.77	17.6	90	4	67.3	0.39	16.1	3	3	69.1

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 5 (Cont.)

STATE=. STATION=MIDWESTERN AREA NURSERY=BLEND

VARIETY	STD	BAKE ABS %	MIX TIME MIN	DOUGH CHAR	CRUMB GRAIN	LOAF VOL	BAKE SCORE ***	GENERAL SCORE ***	DEFICIENCIES									
									TW	KW	SM	WP	EX	A65	FP	MC	MX	B&A
BUTTE 86	S	67.2	3.00	8	101	8	88	5	905	4	4.0					MI	MI	
CHRIS	S	68.0	3.00	8	100	4	86	3	875	3	3.7	MI	MI			MI	MI	
ERA	S	67.4	4.00	8	100	7	87	4	820	3	3.7	MI	MI			MI	MI	
MARQUIS	S	66.0	3.50	8	100	7	88	4	895	3	3.3	MI	MI			MI	MI	
STOA	S	67.1	4.25	8	100	7	88	8	810	4	4.0	MI	MI			MI	MI	
BZ 986-345	S	65.7	3.50	9	100	8	88	8	935	4	3.7	MI	MI			MI	MI	
FA 984-384	S	65.7	3.50	8	100	6	86	4	830	3	3.3	MI	MI			MI	MI	
HS 85-30	S	68.1	3.50	9	102	8	87	6	920	4	4.0	MI	MI			MI	MI	
HS 85-476	S	67.3	4.75	9	100	8	88	4	935	3	3.3	MI	MI			MI	MI	
HS 85-674	S	67.9	5.50	9	100	7	87	4	935	3	3.7	MI	MI			MI	MI	
HS 85-902	S	65.6	4.00	8	100	6	85	3	825	3	3.3	MI	MI			MI	MI	
MN 81110	S	68.2	3.50	8	100	6	85	4	895	3	3.0	MI	MI			MI	MI	
MN 82354	S	66.7	3.25	8	100	6	89	8	810	4	4.0	MI	MI			MI	MI	
MN 85110	S	68.0	2.50	9	101	8	87	4	925	2	3.0	MI	MI			MI	MI	
MN 85167	S	63.9	3.75	9	100	7	88	6	950	4	3.7	MI	MI			MI	MI	
MN 85324	S	68.4	4.25	8	100	8	86	3	875	3	3.3	MI	MI			MI	MI	
MN 85328	S	67.8	3.50	8	101	8	88	6	855	4	3.3	MI	MI			MI	MI	
ND 618	S	69.0	4.00	8	100	7	89	8	855	4	4.0	MI	MI			MI	MI	
ND 626	S	68.1	3.75	8	100	8	88	4	865	3	3.7	MI	MI			MI	MI	
ND 640	S	65.7	4.50	8	100	7	89	8	835	4	4.0	MI	MI			MI	MI	
ND 650	S	70.0	3.00	9	100	8	87	4	960	3	3.3	MI	MI			MI	MI	
ND 652	S	68.0	3.50	9	100	8	88	6	900	4	3.7	MI	MI			MI	MI	
SD 2980	S	66.7	2.25	7	101	8	87	3	725	1	3.0	MI	MI			MI	MI	
SD 2999	S	67.7	3.00	9	101	8	86	4	910	3	3.3	MI	MI			MI	MI	
SD 3000	S	69.4	4.25	8	101	8	85	3	870	3	3.3	MI	MI			MI	MI	
SD 3005	S	66.1	3.25	8	102	8	85	4	895	3	3.0	MI	MI			MI	MI	
SD 3014	S	66.5	3.25	8	100	7	87	4	885	3	3.3	MI	MI			MI	MI	
WA 7493	S	65.6	4.00	8	103	9	89	8	810	4	3.7	MI	MI			MI	MI	
WA 7494	S	66.7	4.25	8	102	8	90	12	820	4	4.0	MI	MI			MI	MI	
2375	S	66.9	3.00	9	102	8	86	4	900	3	3.3	MI	MI			MI	MI	

DEFICIENCIES TW KW SM WP EX A65 FP MC MX BA MT DC CC CG LV
 MINOR FAULTING VALUES 57.9 21.6 8 13.9 65.9 .47 12.9 3 2,7,8 61.9 5.75-8.00 2.00-2.75 6 6 8 8 0.8
 MAJOR FAULTING VALUES 56.9 18.6 18 12.9 63.9 .51 12.4 2 1,9-11 60.4 UNDER 1.75 OVER 8.00 4 3 4 75.8

*** 1=NO PROMISE 2=LITTLE PROMISE 3=SOME PROMISE 4=GOOD PROMISE

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 6 STATE= STATION=WESTERN AREA NURSERY=BLEND

VARIETY	STD #/BU	TEST WT G.	1000 K.WT G.	SIZING LG \$	WHT ASH %	WHT PRO %	HARD- NESS %	WHEAT- SCORE **	FLR 65%EX %	ASH @ EXT %	FLR PRO %	MILL CHAR \$	MILL SCORE ***	MILL ABS %	MIX PAT %	
BUTTE 86	S	62.4	32.5	32	2	1.58	15.5	87	4	70.0	0.35	14.3	5	4	67.6	4
CHRIS	S	61.4	27.0	13	4	1.57	15.9	84	4	68.9	0.34	15.0	4	4	66.0	4
ERA	S	62.3	28.7	19	5	1.64	14.3	79	4	70.9	0.33	13.0	5	4	63.8	5
MARQUIS	S	61.2	30.8	29	3	1.61	16.0	78	4	68.5	0.36	14.6	4	4	66.0	4
STOA	S	62.2	31.2	22	3	1.56	15.1	86	4	70.9	0.33	14.1	5	4	69.1	6
BZ 986-345	S	62.1	38.4	54	2	1.54	15.4	72	4	68.3	0.34	14.4	4	4	65.0	6
FA 984-384	S	64.1	32.7	27	2	1.50	15.8	94	4	68.5	0.33	14.4	4	4	66.3	4
HS 85-30	S	61.7	32.7	28	3	1.63	14.7	74	4	69.1	0.35	13.6	4	4	67.6	6
HS 85-476	S	60.4	33.3	35	3	1.74	15.5	72	4	71.7	0.31	14.8	5	4	68.8	6
HS 85-674	S	61.9	34.1	33	2	1.46	14.5	69	4	71.1	0.34	13.5	5	4	68.8	6
HS 85-902	S	62.3	33.0	39	2	1.53	15.1	82	4	71.1	0.31	13.9	5	4	64.4	5
MN 81110	S	59.6	34.0	33	2	1.72	16.1	81	4	69.8	0.35	15.2	4	4	70.0	6
MN 82354	S	61.2	32.1	32	3	1.51	14.8	79	4	71.7	0.31	13.8	5	4	66.6	4
MN 85110	S	60.3	38.1	57	1	1.61	15.2	77	4	68.3	0.35	14.2	4	4	66.3	4
MN 85167	S	61.6	32.3	32	3	1.68	14.7	65	4	70.6	0.36	14.0	5	4	60.7	3
MN 85324	S	62.0	34.5	39	2	1.73	14.9	82	4	69.6	0.35	13.6	4	4	67.6	6
MN 85328	S	61.6	30.3	21	3	1.70	16.3	103	4	66.2	0.40	15.0	3	2	66.6	5
ND 618	S	62.2	29.1	19	3	1.66	16.0	93	4	70.5	0.34	14.7	4	4	68.5	5
ND 626	S	62.8	35.1	46	3	1.51	15.8	95	4	70.7	0.33	14.8	5	4	68.5	6
ND 640	S	62.5	28.6	14	3	1.53	16.3	82	4	70.3	0.29	15.3	5	4	68.2	5
ND 650	S	63.2	32.1	30	3	1.50	16.1	99	4	68.6	0.36	14.6	4	4	68.8	4
ND 652	S	62.1	33.0	34	3	1.67	16.4	100	4	69.5	0.36	15.0	4	4	69.4	6
SD 2980	S	63.3	33.4	35	2	1.61	15.6	83	4	68.7	0.30	14.5	4	4	67.3	4
SD 2999	S	61.6	32.9	32	3	1.56	15.0	77	4	69.1	0.34	13.9	4	4	68.5	5
SD 3000	S	61.8	33.8	35	1	1.48	15.1	80	4	68.1	0.35	13.6	4	4	66.3	5
SD 3005	S	62.1	33.0	38	2	1.51	15.9	71	4	69.1	0.29	15.3	4	4	68.2	5
SD 3014	S	62.7	31.9	22	3	1.41	14.9	82	4	67.6	0.32	13.6	4	3	66.3	5
WA 7493	S	61.0	35.5	34	3	1.47	13.7	57	3	70.0	0.35	13.1	5	4	64.2	4
WA 7494	S	60.8	36.9	35	3	1.46	14.1	60	4	71.2	0.34	13.5	5	4	65.0	5
2375	S	63.0	36.4	39	2	1.54	15.3	86	4	68.8	0.32	13.9	4	4	67.3	4

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 6 (Cont.)

STATE= STATION=WESTERN AREA NURSERY=BLEND

VARIETY	STD	BAKE ABS %	MIX TIME MIN	DOUGH CHAR	CRUMB COLOR	GRAIN VOL	LOAF VOL	BAKE SCORE ***	GENERAL SCORE ***	DEFICIENCIES							
										TW	KW	SM	WP	EX	A65	FP	MC
BUTTE	86	S	67.1	2.50	7	100	8	88	6	765	3	3.7			MI	MI	MI
CHRIS	S	64.1	2.50	7	101	6	87	4	715	2	3.3			MI	MI	MI	MI
ERA	S	62.8	3.00	7	101	8	88	6	790	4	4.0			MI	MI	MI	MI
MARQUIS	S	65.2	2.75	7	102	8	86	4	770	2	3.3			MI	MI	MI	MI
STOA	S	67.7	3.75	7	101	8	87	4	750	3	3.7			MI	MI	MI	MI
BZ 986-345	S	67.7	3.75	7	101	8	87	4	750	3	3.7			MI	MI	MI	MI
FJA 984-384	S	64.7	2.50	7	100	7	89	11	750	3	3.7			MI	MI	MI	MI
HS 85-30	S	66.0	3.75	8	100	8	89	11	870	4	4.0			MI	MI	MI	MI
HS 85-476	S	67.3	3.75	8	102	8	88	6	860	4	4.0			MI	MI	MI	MI
HS 85-674	S	66.3	3.75	8	102	8	87	4	840	3	3.7			MI	MI	MI	MI
HS 85-902	S	62.8	3.25	7	100	8	88	8	770	4	4.0			MI	MI	MI	MI
MN 81110	S	69.5	3.25	8	100	6	90	12	800	4	4.0			MI	MI	MI	MI
MN 82354	S	64.2	2.75	7	100	8	89	11	735	3	3.7			MI	MI	MI	MI
MN 85110	S	63.9	2.50	8	102	8	88	6	815	3	3.7			MI	MI	MI	MI
MN 85167	S	59.0	2.75	7	100	6	88	8	770	1	3.0			MI	MI	MI	MI
MN 85324	S	66.2	3.25	8	100	8	89	12	825	4	4.0			MI	MI	MI	MI
MN 85328	S	65.1	3.00	8	101	8	88	6	860	4	3.3			MI	MI	MI	MI
ND 618	S	67.1	2.75	7	100	8	88	4	775	2	3.3			MI	MI	MI	MI
ND 626	S	67.3	3.25	7	101	8	88	4	785	3	3.7			MI	MI	MI	MI
ND 640	S	67.0	3.00	8	101	8	88	6	815	4	4.0			MI	MI	MI	MI
ND 650	S	67.9	2.25	8	101	8	89	11	815	3	3.7			MI	MI	MI	MI
ND 652	S	67.1	3.25	8	102	8	90	8	855	4	4.0			MI	MI	MI	MI
SD 2980	S	65.8	2.25	8	103	9	87	3	855	2	3.3			MI	MI	MI	MI
SD 2999	S	66.4	2.50	8	100	7	88	6	840	3	3.7			MI	MI	MI	MI
SD 3000	S	65.2	3.50	7	102	8	87	4	800	3	3.7			MI	MI	MI	MI
SD 3005	S	66.1	2.50	7	99	4	88	7	780	3	3.7			MI	MI	MI	MI
SD 3014	S	67.2	3.25	7	100	8	87	4	815	3	3.3			MI	MI	MI	MI
WA 7493	S	61.9	3.25	7	104	9	90	12	805	3	3.3			MI	MI	MI	MI
WA 7494	S	62.8	3.25	7	104	9	89	8	810	4	4.0			MI	MI	MI	MI
2375	S	65.9	2.75	7	103	9	89	8	790	3	3.7			MI	MI	MI	MI

DEFICIENCIES	TW	KW	SM	WP	EX	A65	FP	MC	MX	BA	MT	DC	CC	CG	LV	
MINOR FAULTING VALUES	57.9	28.1	8	13.9	67.8	.47	12.9	3	2',7,8	61.9	5-75-8.00	2.00-2.75	6	6	6.88	
MAJOR FAULTING VALUES	56.9	25.1	18	12.9	65.8	.51	12.4	2	1,9-11	60.4	UNDER 1.75	OVER 8.00	4	3	4	6.38

*** 1=NO PROMISE 2=LITTLE PROMISE 3=SOME PROMISE 4=GOOD PROMISE.

QUALITY DATA OF SPRING WHEAT SAMPLES 1968 CROP

STATE=NORTH DAKOTA STATION=MINOT NURSERY=UNIFORM

TABLE 7

VARIETY	STD	TEST WT # / BU	1000 SIZING			WHT SM %	ASH PRO %	HARD-NESS *** %	WHEAT SCORE **** %	FLR 65% EX %	ASH Q %	FLR PRO %	MILL CHAR %	MILL SCORE *** %	MIX ABS %	MIX PAT %
			K.WT G.	LG %	SM %											
BUTTE 86	S	61.8	32.1	24	2	1.83	16.9	83	4	62.6	0.47	16.6	3	3	71.2	6
CHRIS	S	61.0	26.2	8	3	1.89	17.6	81	4	59.5	0.55	17.3	2	1	67.6	5
ERA	S	59.2	31.6	48	4	1.93	15.7	87	4	63.4	0.66	15.1	3	2	67.9	4
MARQUIS	S	61.0	28.8	18	2	1.88	16.6	80	4	58.1	0.57	16.4	2	1	66.0	4
STOAA	S	62.0	28.9	11	2	1.90	16.5	85	4	61.8	0.49	16.3	3	3	70.0	7
BZ 986-345	S	60.6	38.3	70	0	1.93	18.7	70	4	54.1	0.54	18.5	2	1	70.0	7
FA 984-384	S	62.8	29.4	10	1	1.71	17.4	93	4	62.8	0.49	17.2	3	3	70.0	6
HS 85-30	S	61.3	33.7	40	2	1.84	16.4	75	4	60.6	0.54	16.2	3	3	72.0	8
HS 85-476	S	58.6	31.2	45	2	2.14	19.7	73	4	57.4	0.60	19.5	2	1	71.2	7
HS 85-674	S	60.3	31.4	15	2	1.76	16.7	61	4	58.7	0.51	16.5	2	1	68.8	8
HS 85-902	S	60.1	31.9	47	2	1.87	17.6	92	4	60.7	0.54	17.4	3	3	69.4	6
MN 81110	S	58.6	34.0	48	2	2.15	20.0	79	4	58.1	0.65	19.8	2	1	72.0	7
MN 82354	S	60.8	29.2	19	3	1.82	18.5	66	4	63.0	0.47	17.2	3	3	68.8	5
MN 85110	S	58.0	37.7	72	1	2.02	18.5	87	4	57.8	0.70	18.3	2	1	69.7	4
MN 85167	S	59.9	32.9	33	2	1.96	17.2	56	4	56.9	0.59	17.0	2	1	64.4	4
MN 85324	S	60.6	35.2	52	2	1.98	16.8	76	4	61.0	0.57	16.6	3	3	70.6	7
MN 85328	S	61.0	25.8	5	2	2.02	18.7	101	4	57.4	0.66	18.4	2	1	70.0	6
ND 618	S	61.8	25.6	3	3	1.92	17.2	83	3	63.9	0.54	16.9	3	3	68.2	7
ND 626	S	62.6	32.1	35	2	1.85	18.0	86	4	67.6	0.46	17.8	4	4	69.4	7
ND 640	S	61.8	26.5	5	2	1.92	17.9	80	4	63.5	0.51	17.7	3	3	69.4	7
ND 650	S	62.2	29.2	19	3	1.95	19.0	97	4	62.4	0.52	18.8	3	3	71.2	6
ND 652	S	60.7	28.5	17	2	1.93	18.6	90	4	61.7	0.56	18.4	3	3	70.3	6
SD 2980	S	63.2	30.6	15	1	1.65	16.9	71	4	63.3	0.39	16.4	3	3	69.1	5
SD 2999	S	60.5	27.1	11	2	1.79	17.5	69	4	56.4	0.52	16.7	2	1	67.6	5
SD 3000	S	60.6	31.2	21	2	1.93	16.5	74	4	59.9	0.51	15.8	2	1	68.5	8
SD 3005	S	61.0	28.8	15	2	1.81	18.0	69	4	59.4	0.46	17.3	2	1	70.0	6
SD 3014	S	61.8	29.1	9	3	1.79	15.7	73	4	61.0	0.49	15.0	3	3	66.6	6
WA 7493	S	61.2	33.0	22	1	1.65	16.9	64	4	60.4	0.48	16.7	3	2	66.6	7
WA 7494	S	61.1	34.1	29	1	1.69	17.1	54	4	60.6	0.50	16.7	3	3	67.6	6
2375	S	62.3	34.8	22	1	1.93	18.1	91	4	62.3	0.50	17.7	3	3	71.2	6

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 7 (Cont.)

VARIETY	;TD	BAKE ABS %	MIX TIME MIN	DOUGH CHAR	CRUMB COLOR	GRAIN VOL	BAKE SCORE ***	GENERAL SCORE ***	DEFICIENCIES							NURSERY=UNIFORM							
									TW	KW	SM	WP	EX	A65	FP	MC	MX	BA	MT	DC	CC	CG	LV
BUTTE 86	S	67.2	3.50	7	100	7	88	4	169	3	3.3								MI	MJ	MI	MI	MI
CHRIS	S	63.6	3.75	7	100	7	88	6	175	4	3.0								MI	MJ	MI	MI	MI
ERA	S	63.9	3.50	8	100	7	88	6	186	4	3.3								MJ	MJ	MJ	MJ	MJ
MARQUIS	S	64.0	3.25	7	100	8	87	3	171	3	2.7								MI	MI	MI	MI	MI
STOAN	S	68.0	6.25	7	100	7	86	3	173	2	3.0								MJ	MJ	MJ	MJ	MJ
BZ 986-345	S	68.0	4.75	9	101	8	87	3	201	3	2.7								MI	MI	MI	MI	MI
FA 984-384	S	68.0	3.50	6	101	4	87	3	160	3	3.3								MI	MI	MI	MI	MI
HS 85-30	S	68.0	3.75	8	101	6	88	4	186	3	3.3								MI	MI	MI	MI	MI
HS 85-476	S	67.2	5.25	9	100	8	88	6	207	4	3.0								MJ	MJ	MJ	MJ	MJ
HS 85-674	S	66.8	7.50	9	101	6	88	4	192	2	2.3								MI	MI	MI	MI	MI
HS 85-902	S	65.4	4.75	8	101	4	85	3	181	3	3.3								MI	MI	MI	MI	MI
MN 81110	S	68.0	3.75	8	101	4	86	4	174	3	2.7								MI	MI	MI	MI	MI
MN 82354	S	65.8	3.75	7	100	6	88	6	172	4	3.7								MI	MI	MI	MI	MI
MN 85110	S	65.7	2.75	9	100	8	90	12	204	3	2.7								MJ	MJ	MJ	MJ	MJ
MN 85167	S	62.4	3.75	9	100	6	90	11	189	4	3.0								MI	MI	MI	MI	MI
MN 85324	S	66.6	4.75	9	101	7	88	4	200	3	3.3								MI	MI	MI	MI	MI
MN 85328	S	66.0	3.50	8	100	7	88	4	176	3	2.7								MI	MI	MI	MI	MI
ND 618	S	65.2	5.75	9	100	4	87	3	185	2	2.7								MI	MI	MI	MI	MI
ND 626	S	65.4	4.75	7	100	8	87	4	176	3	3.7								MI	MI	MI	MI	MI
ND 640	S	65.4	5.00	9	101	6	89	8	182	4	3.7								MI	MI	MI	MI	MI
ND 650	S	67.2	2.75	9	101	6	88	4	189	2	3.0								MI	MI	MI	MI	MI
ND 652	S	66.3	3.75	9	99	0	88	4	188	2	3.0								MI	MI	MI	MI	MI
SD 2980	S	65.1	3.00	6	100	8	88	6	166	4	3.7								MI	MI	MI	MI	MI
SD 2999	S	64.6	3.75	9	100	7	89	8	197	4	3.0								MJ	MJ	MJ	MJ	MJ
SD 3000	S	64.5	5.50	9	100	7	89	8	187	4	3.0								MI	MI	MI	MI	MI
SD 3005	S	66.0	3.75	9	102	6	85	3	192	3	2.7								MI	MI	MI	MI	MI
SD 3014	S	62.6	4.50	7	101	7	87	4	178	3	3.3								MI	MI	MI	MI	MI
WA 7493	S	62.6	5.00	7	102	8	88	6	177	4	3.3								MI	MI	MI	MI	MI
WA 7494	S	63.6	4.50	9	102	8	88	6	187	4	3.7								MI	MI	MI	MI	MI
2375	S	67.2	3.25	9	101	6	88	6	186	4	3.7								MI	MI	MI	MI	MI

DEFICIENCIES TW KW SM WP EX A65 FP MC MX BA MT DC CC CG LV
MINOR FAULTING VALUES 57.9 28.8 8 13.9 60.5 .57 12.9 3 2,7,8 61.9 5.75-8.00 2.00-2.75 6 6 6 8 155
MAJOR FAULTING VALUES 56.9 25.8 18 12.9 58.5 .61 12.4 2 1,9-11 60.4 UNDER 1.75 OVER 8.00 4 3 4 145

*** 1=NO PROMISE 2=LITTLE PROMISE 3=SOME PROMISE 4=GOOD PROMISE.

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 8 (Cont.)

STATE=NORTH DAKOTA STATION=CARRINGTON NURSERY=UNIFORM

VARIETY	STD %	BAKE ABS MIN	MIX TIME CHAR MIN	DOUGH COLOR	CRUMB GRAIN	LOAF VOL	BAKE SCORE ***	GENERAL SCORE ***	--DEFICIENCIES--										
									TW	KW	SM	WP	EX	A65	FP	MC	MX	B'A	MIX TIME (MT)
BUTTE	S	66.6	3.00	6	101	7	88	3	163	3	3.3			MI	MI	MI	MI	MI	MI
CHRIS	S	63.1	2.50	7	100	6	86	4	170	2	3.0			MI	MI	MI	MI	MI	MI
ERA	S	62.6	3.75	7	100	7	87	4	179	3	3.7			MI	MI	MI	MI	MI	MI
MARQUIS	S	60.3	3.00	8	100	4	86	3	181	1	2.0			MJ	MI	MJ	MJ	MI	MI
STOAA	S	62.6	4.50	7	100	7	89	8	171	4	3.7			MJ	MI	MI	MI	MI	MI
BZ 986-345	S	62.2	4.50	9	101	8	86	3	200	3	2.7			MJ	MI	MI	MI	MI	MI
FA 984-384	S	64.3	2.75	6	100	4	87	3	154	2	2.3			MI	MI	MI	MI	MI	MI
HS 85-30	S	64.5	4.25	9	100	8	88	6	187	4	3.0			MI	MI	MI	MI	MI	MI
HS 85-475	S	61.8	4.00	9	100	8	88	8	220	3	2.7			MI	MI	MI	MI	MI	MI
HS 85-674	S	62.6	4.50	9	101	7	90	11	190	3	2.7			MI	MI	MI	MI	MI	MI
HS 85-902	S	62.8	3.50	7	100	7	88	6	169	4	3.0			MI	MI	MI	MI	MI	MI
MN 81110	MN	62.7	3.00	8	100	4	87	4	173	3	2.7			MI	MI	MI	MI	MI	MI
MN 82354	MN	61.6	3.00	7	101	4	87	3	171	2	2.3			MI	MI	MI	MI	MI	MI
MN 85110	MN	64.0	2.50	8	100	8	87	6	185	3	2.7			MI	MI	MI	MI	MI	MI
MN 85167	MN	61.6	3.25	9	100	7	88	6	202	3	2.7			MI	MI	MI	MI	MI	MI
MN 85324	MN	63.8	4.00	4	100	7	89	8	180	1	2.0			MI	MI	MI	MI	MI	MI
MN 85328	MN	63.4	3.75	9	100	7	87	4	194	3	2.7			MI	MI	MI	MI	MI	MI
ND 618	ND	62.6	3.50	7	101	7	87	3	178	3	2.7			MI	MI	MI	MI	MI	MI
ND 626	ND	63.6	4.00	6	101	7	87	4	170	3	2.7			MI	MI	MI	MI	MI	MI
ND 640	ND	64.6	4.50	8	100	4	88	6	184	3	2.7			MI	MI	MI	MI	MI	MI
ND 650	ND	63.2	2.75	9	100	7	88	4	186	2	2.3			MI	MI	MI	MI	MI	MI
ND 652	ND	62.3	3.25	8	100	7	88	4	182	3	2.7			MI	MI	MI	MI	MI	MI
SD 2980	SD	61.6	3.00	6	100	7	88	7	161	3	2.7			MI	MI	MI	MI	MI	MI
SD 2999	SD	61.6	3.75	9	100	8	88	4	187	2	2.3			MI	MI	MI	MI	MI	MI
SD 3000	SD	63.2	5.25	4	100	8	91	12	181	2	2.3			MI	MI	MI	MI	MI	MI
SD 3005	SD	60.9	3.00	8	101	7	88	3	180	2	2.3			MI	MI	MI	MI	MI	MI
SD 3014	SD	62.3	4.00	8	101	8	87	4	180	3	2.7			MI	MI	MI	MI	MI	MI
WA 7493	WA	59.0	4.00	8	102	8	87	4	183	1	2.0			MI	MI	MI	MI	MI	MI
WA 7494	WA	59.6	4.25	7	103	8	88	6	164	2	2.3			MI	MI	MI	MI	MI	MI
2375		63.7	3.00	6	102	6	88	6	161	4	3.0			MI	MI	MI	MI	MI	MI

DEFICIENCIES	TW	KW	SM	WP	EX	A65	FP	MC	MX	B'A	MIX TIME (MT)	DC	CC	CG	LV	
MINOR FAULTING VALUES	57.9	26.6	8	13.9	65.8	.57	12.9	3	2,7,8	61.9	5.75-8.00	2.00-2.75	6	6	8	150
MAJOR FAULTING VALUES	56.9	23.6	18	12.9	63.8	.61	12.4	2	1,9-11	60.4	UNDER 1.75	OVER 8.00	4	3	4	140

*** 1=NO PROMISE 2=LITTLE PROMISE 3=SOME PROMISE 4=GOOD PROMISE.

TABLE 9

DEFICIENCIES	W	RW	GW	WW	CX	PIC-5	FPC	MC	MQ	MX
MINOR FAILING VOLUMES	57.9	21.3	8	1.74	15.9	58.7	5.67	12.9	3	61.2
MAJOR FAILING VOLUMES	55.9	19.3	16	1.01	12.9	56.7	6.4	12.4	2	60.4
DEFICIENCIES	113.8	40.6	24	2.75	30.7	115.4	12.0	35.3	5	114.1

TABLE 10

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP
STATE=NORTH DAKOTA STATION=WILLISTON NURSERY=UNIFORM

E
UNIFORM
AMERICAN

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

STATE=NORTH DAKOTA STATION=FARGO NURSERY=FIELD PLOTS

VARIETY	STD WT # / BU	TEST WT K.WT G.	1000 SIZING LG SM %	WHT ASH %	WHT PRO %	HARD- NESS PRO %	WHEAT SCORE ** %	FLR EXT %	ASH @ 65% EX %	FLR PRO %	MILL CHAR *** %	MILL SCORE **** %	MIX ABS %	MIX PAT %	
LEN	S	61.5	28.7	15	2	1.81	16.6	92	4	69.5	0.44	15.5	4	4	69.7
MARSHALL		59.8	25.2	7	4	1.89	15.9	87	4	69.5	0.44	14.8	4	4	66.3
STOA		60.4	25.1	7	6	1.85	15.9	85	4	68.1	0.43	15.1	4	4	68.5

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

STATE=NORTH PAKOTA STATION=FARGO NURSERY=FIELD PILOTS

VARIETY	STD	BAKE ABS %	DOUGH TIME MIN	CRUMB COLOR	GRAIN VOL	LOAF CC	BAKE SCORE ***	GENERAL SCORE ***	DEFICIENCIES					
									TW	KW	SM	WP	EX	A65

DEFICIENCIES	TW	KW	SM	WP	EX	A65	FP	MC	MX	B4	MIX TIME (MT)	DC	CC	CG	LV
MINOR FAULTING VALUES	57.9	26.6	8	13.9	67.4	.47	12.9	3	2,7,8	61.9	5.75-8.00	2.00-2.75	6	6	885
MAJOR FAULTING VALUES	56.9	23.6	18	12.9	65.4	.51	12.4	2	1,9-11	60.4	UNDER 1.75	OVER 8.00	4	3	835
LEN	S	64.0	4.50	9	101	8	87	4	940	3	3.7	MI	MJ	MJ	MJ
MARSHALL		61.8	3.25	9	101	8	87	4	870	1	3.0	MI	MJ	MJ	MJ
STOA		63.0	4.50	9	101	8	87	3	875	2	3.3	MI	MI	MI	MI

* * * * * 1 = NO 2 = YES 3 = SOME 4 = MOST 5 = PROMISE

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 12 STATE=NORTH DAKOTA STATION=MINOT NURSERY=FIELD PLOTS

VARIETY	STD #/BU	TEST WT K.WT G.	1000 SIZING LG SM	WHT ASH %	HARD- NESS PRO %	WHEAT SCORE ***	FLR EXT %	ASH @ %	FLR PRO %	MILL CHAR %	MILL SCORE ***	MIX ABS %	MIX PAT %	
												WT	K.WT	
COTEAU	60.4	26.5	12	5	2.01	16.4	80	3	68.2	0.43	15.6	4	69.4	5
LEN	61.7	35.5	58	3	1.83	17.8	75	4	70.1	0.44	17.0	5	71.2	8
STOA	60.9	29.2	18	4	1.95	16.2	73	3	68.3	0.42	15.6	4	69.7	6

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

STATE=NORTH DAKOTA STATION=MINOT NURSERY=FIELD PLOTS

VARIETY	STD %	BAKE ABS MIN	MIX TIME CHAR	DOUGH COLOR	CRUMB GRAIN	LOAF VOL GRAIN	BAKE SCORE ***	GENERAL SCORE ***	DEFICIENCIES										
									TW	KW	SM	WP	EX	A65	FP	MC	MX	BA	MIX TIME (MT)
COTEAU	66.0	2.50	8	100	4	87	4	875	1	2.7	MJ								
LEN	65.0	4.00	9	100	4	87	4	970	3	3.7	MJ								
STOA	63.0	3.50	8	100	7	88	6	880	3	3.3	MJ								

DEFICIENCIES	TW	KW	SM	WP	EX	A65	FP	MC	MX	BA	MIX TIME (MT)	DC	CC	CG	LV	
												DEFICIENCIES	MINOR FAULTING VALUES	MINOR FAULTING VALUES	MINOR FAULTING VALUES	MINOR FAULTING VALUES
DEFICIENCIES	57.9	33.4	8	13.9	68.0	.47	12.9	3	2,7,8	61.9	5.75-8.00	2.00-2.75	6	6	8	915
MINOR FAULTING VALUES	56.9	30.4	18	12.9	66.0	.51	12.4	2	1,9-11	60.4	UNDER 1.75	OVER 8.00	4	3	4	865
MINOR FAULTING VALUES	56.9	30.4	18	12.9	66.0	.51	12.4	2	1,9-11	60.4	UNDER 1.75	OVER 8.00	4	3	4	865

** 1=NO PROMISE 2=LITTLE PROMISE 3=SOME PROMISE 4=GOOD PROMISE.

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 13 STATE=NORTH DAKOTA STATION=LANGDON NURSERY=FIELD PLOTS

VARIETY	STD #/BU	TEST WT K.WT G.	1000 SIZING LG SM ASH %	WHT PRO NESS %	HARD- NESS %	WHEAT SCORE ***	FLR EXT %	ASH @ %	FLR 65%EX %	FLR PRO %	MILL CHAR %	MILL SCORE ***	MILL CHAR %	MIX ABS %	MIX PAT %	
LEN	S	63.4	37.5	74	1	1.76	16.0	77	4	70.7	0.38	15.2	5	4	69.1	6
MARSHALL		62.6	33.9	58	2	1.86	15.4	80	4	72.1	0.35	14.7	5	4	65.7	3
STOA		62.6	30.2	26	1	1.76	16.4	89	3	69.1	0.39	15.7	4	4	68.5	5

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

STATE=NORTH DAKOTA STATION=LANGDON NURSERY=FIELD PLOTS

VARIETY	STD %	BAKE ABS %	MIX TIME MIN	DOUGH CHAR	CRUMB COLOR	CRUMB GRAIN	BAKE VOL	GENERAL SCORE ***	DEFICIENCIES-TW KW SH WP EX A65 FP MC MX BA MT DC CC CG LV						
LEN	S	64.2	3.00	8	100	7	89	6	880	4	4.0				
MARSHALL		59.6	2.25	7	101	7	88	12	850	1	3.0	MI	MJ	MI	MI
STOA		63.6	3.25	7	102	7	87	4	845	3	3.3	MJ			

DEFICIENCIES	TW	KW	SM	WP	EX	A65	FP	MC	MX	BA	MIX TIME (MT)	DC	CC	CG	L.V
MINOR FAULTING VALUES	57.9	35.4	8	13.9	68.6	.47	12.9	3	2,7,8	61.9	5.75-8.00	2.00-2.75	6	6	8
MAJOR FAULTING VALUES	56.9	32.4	18	12.9	66.6	.51	12.4	2	1,9-11	60.4	UNDER 1.75	OVER 8.00	4	3	4

*** 1=NO PROMISE 2=LITTLE PROMISE 3=SOME PROMISE 4=GOOD PROMISE.

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 14

STATE=CALIFORNIA STATION=IMPERIAL VALLEY NURSERY=FIELD PLOTS

VARIETY	STD	TEST WT #/BU	1000 K.WT G.	SIZING LG %	WHIT SM %	HARD- NESS PRO %	WHEAT ASH %	FLR EXT *** %	ASH @ 65% EX %	FLR PRO %	MILL CHAR *** %	MILL SCORE *** %	MILL CHAR *** %	MIX ABS %	MIX PAT %	
KLASIC		64.9	44.6	70	2	1.56	11.8	71	2	74.1	0.38	11.1	5	2	61.9	8
PROBRED		63.4	40.5	45	3	1.61	12.3	83	2	70.5	0.42	11.2	5	2	63.5	5
TADINA		63.2	33.2	31	3	1.67	11.6	83	1	70.2	0.40	10.4	5	2	61.6	2
YECORA ROJO	S	64.1	43.7	56	3	1.59	12.4	84	2	71.2	0.39	11.4	5	2	64.4	7
CM 16076		63.9	37.7	47	3	1.63	11.1	67	1	72.7	0.38	10.1	4	2	60.3	7
PH 983-69		63.7	40.3	46	3	1.63	12.2	81	2	70.4	0.44	11.0	5	2	64.2	7
PH 984-75		63.1	33.4	28	4	1.63	12.4	66	1	71.4	0.41	11.3	5	2	63.8	7
UC 683		64.8	40.8	65	2	1.48	10.6	93	2	66.2	0.47	9.4	3	1	63.8	3
UC 702		65.4	35.6	50	3	1.56	12.4	77	1	69.5	0.40	11.2	4	2	64.7	6
UC 703		64.8	37.0	50	2	1.60	12.3	85	1	69.0	0.41	11.2	4	1	66.0	4
UC 784		64.2	41.2	50	3	1.57	11.4	76	2	70.0	0.42	10.3	5	2	63.2	4
UC 785		64.7	40.3	46	2	1.58	11.1	77	2	69.8	0.43	10.0	4	2	60.7	3
UC 786		64.0	35.5	34	3	1.57	11.1	81	1	70.1	0.39	10.1	5	2	60.7	5

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

STATE=CALIFORNIA STATION=IMPERIAL VALLEY NURSERY=FIELD PLOTS

VARIETY	STD	BAKE ABS %	MIX TIME MIN	DOUGH CHAR	CRUMB COLOR	GRAIN VOL CC	LOAF VOL CC	BAKE SCORE ***	GENERAL SCORE ***	DEFICIENCIES-- TW KW SM WP EX A65 FP MC MX BA MT DC CC CG LV	
KLASIC		62.4	5.00	7	100	7	88	6	860	4	2.7
PROBRED		63.8	3.75	6	102	8	87	4	750	3	2.3
TADINA		61.8	2.75	1	100	7	86	3	670	1	1.3
YECORA ROJO	S	64.9	4.75	5	101	6	86	4	790	3	2.3
CM 16076		60.6	5.00	6	101	7	88	6	785	3	2.0
PH 983-69		64.7	5.00	5	100	7	86	3	795	3	2.3
PH 984-75		64.4	5.25	7	100	7	88	6	805	4	2.3
UC 683		64.8	2.75	1	99	4	87	3	665	1	1.3
UC 702		65.4	4.75	8	100	7	85	4	785	3	2.0
UC 703		66.7	3.00	5	100	4	86	5	735	3	1.7
UC 784		64.3	3.50	5	101	7	87	6	710	3	2.3
UC 785		61.7	4.00	2	102	7	88	8	685	1	1.7
UC 786		60.0	4.25	7	100	7	88	12	750	3	2.0

VARIETY	STD	TEST WT #/BU	1000 K.WT G.	SIZING LG %	WHIT SM %	HARD- NESS PRO %	WHEAT ASH %	FLR EXT *** %	ASH @ 65% EX %	FLR PRO %	MILL CHAR *** %	MILL SCORE *** %	MILL CHAR *** %	MIX ABS %	MIX PAT %	
KLASIC		62.4	5.00	7	100	7	88	6	860	4	2.7			MJ	MJ	MJ
PROBRED		63.8	3.75	6	102	8	87	4	750	3	2.3			MJ	MJ	MJ
TADINA		61.8	2.75	1	100	7	86	3	670	1	1.3			MJ	MJ	MJ
YECORA ROJO	S	64.9	4.75	5	101	6	86	4	790	3	2.3			MJ	MJ	MJ
CM 16076		60.6	5.00	6	101	7	88	6	785	3	2.0			MJ	MJ	MJ
PH 983-69		64.7	5.00	5	100	7	86	3	795	3	2.3			MJ	MJ	MJ
PH 984-75		64.4	5.25	7	100	7	88	6	805	4	2.3			MJ	MJ	MJ
UC 683		64.8	2.75	1	99	4	87	3	665	1	1.3			MJ	MJ	MJ
UC 702		65.4	4.75	8	100	7	85	4	785	3	2.0			MJ	MJ	MJ
UC 703		66.7	3.00	5	100	4	86	5	735	3	1.7			MJ	MJ	MJ
UC 784		64.3	3.50	5	101	7	87	6	710	3	2.3			MJ	MJ	MJ
UC 785		61.7	4.00	2	102	7	88	8	685	1	1.7			MJ	MJ	MJ
UC 786		60.0	4.25	7	100	7	88	12	750	3	2.0			MJ	MJ	MJ

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

TABLE 15 STATE=ARIZONA STATION=TUCSON NURSERY=FIELD PLOTS

VARIETY	STD #/BU	TEST WT G.	1000 SIZING			WHT PRO ASH % %			HARD-NESS SCORE ***			FLR 65%EX PRO % %			FLR MILL CHAR SCORE ***			MILL MIX ABS PAT %		
			K.WT	L.G.	S.H.	ASH	PRO	ASH	PRO	ASH	PRO	ASH	PRO	ASH	PRO	ASH	PRO	ASH	PRO	
KLASSIC		65.3	48.5	86	1	1.38	11.6	46	2	73.7	0.35	11.2	4	2	62.5	6				
PROBRED		64.7	49.0	80	0	1.44	11.8	61	2	72.4	0.37	10.9	5	2	62.8	5				
TOPAZ		64.0	53.8	87	1	1.49	11.3	26	2	69.5	0.33	9.9	0	1	61.3	2				
WESTBRED 911		64.6	46.9	77	0	1.33	11.6	69	2	68.2	0.33	10.1	4	1	62.5	4				
WESTBRED BAKER		65.4	47.4	76	1	1.41	12.6	63	2	72.1	0.34	11.5	5	2	64.7	6				
YECORO ROJO	S	65.1	48.3	79	1	1.39	12.7	58	2	71.8	0.31	11.6	5	2	65.3	6				

QUALITY DATA OF SPRING WHEAT SAMPLES 1988 CROP

STATE=ARIZONA STATION=TUCSON NURSERY=FIELD PLOTS

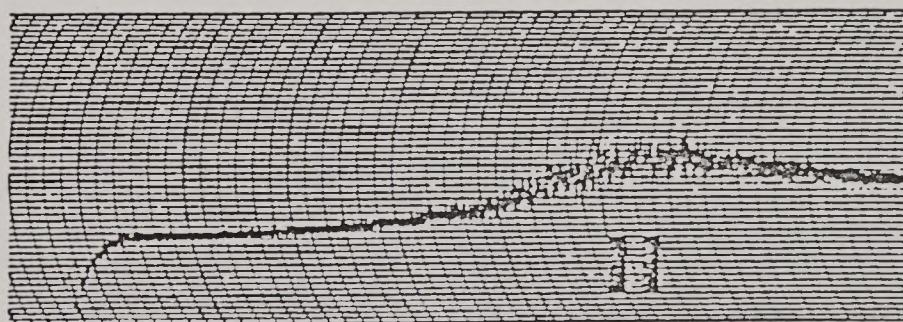
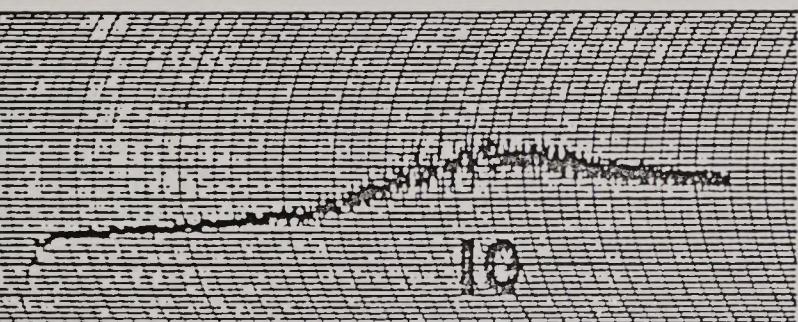
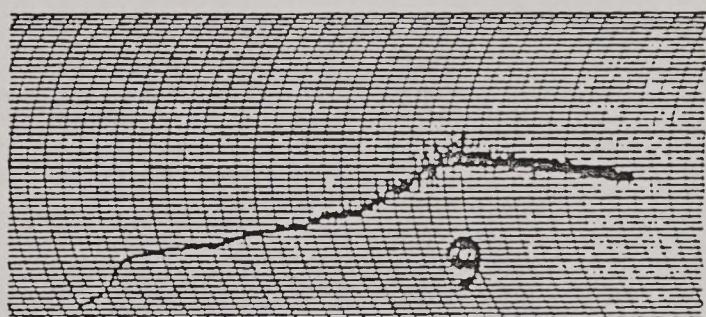
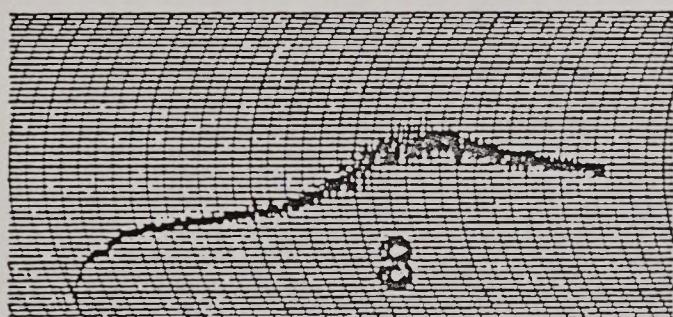
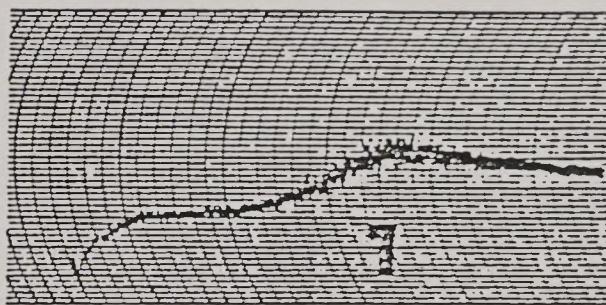
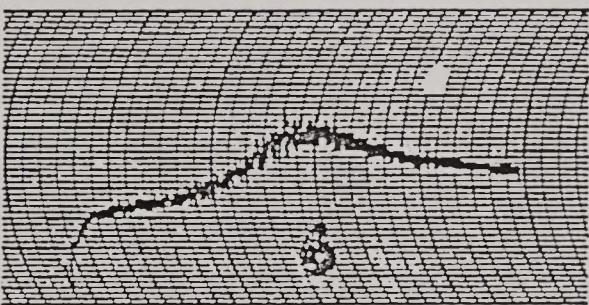
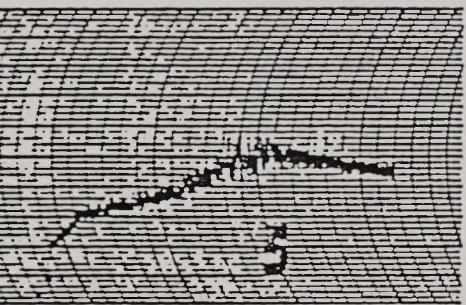
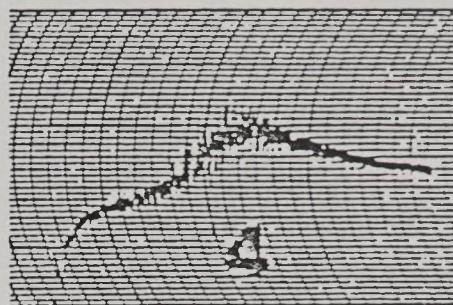
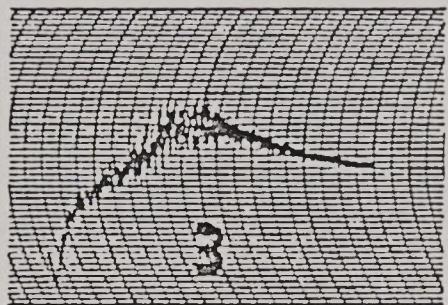
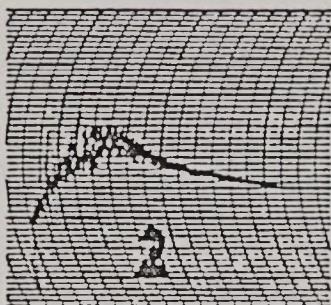
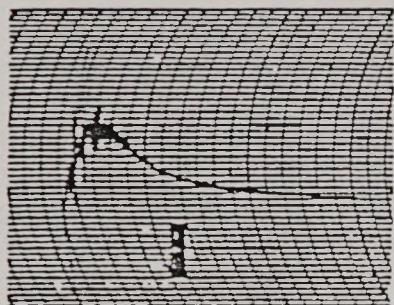
VARIETY	STD %	BAKE ABS MIN	BAKE MIX DOUGH			CRUMB COLOR			LOAF GRAIN VOL			BAKE GENERAL			DEFICIENCIES		
			TW	KW	SM	WP	EX	A65	FP	MC	MX	BA	MT	DC	CC	CG	LV
KLASSIC		61.7	4.25	8	102	8	87	4	820	2	2.0						
PROBRED		63.5	4.00	7	101	8	88	3	735	2	2.0						
TOPAZ		60.3	2.25	5	103	9	88	8	710	1	1.3						
WESTBRED 911		67.1	3.50	2	100	7	87	4	680	1	1.3						
WESTBRED BAKER		63.8	4.00	7	103	9	87	4	770	3	2.3						
YECORO ROJO	S	63.3	4.00	7	101	8	88	6	790	4	2.7						

DEFICIENCIES	TW	KW	SM	WP	EX	A65	FP	MC	MX	BA	MIX TIME (MT)	DC	CC	CG	LV	
MINOR FAULTING VALUES	57.9	46.2	8	13.9	69.7	.47	12.9	3	2,7,8	61.9	5.75-6.00	2.00-2.75	6	6	735	
MAJOR FAULTING VALUES	56.9	43.2	18	12.9	67.7	.51	12.4	2	1,9-11	60.4	UNDER 1.75	OVER 8.00	4	3	4	605

1=NO PROMISE 2=LITTLE PROMISE 3=SOME PROMISE 4=GOOD PROMISE

REFERENCE MIXOGRAMS

HARD RED SPRING WHEAT



U.S.D.A. SPRING WHEAT QUALITY LABORATORY

FARGO, NORTH DAKOTA

